FEBRUARY, 1952

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION

Prefab Coils Cut Panel Heating Costs

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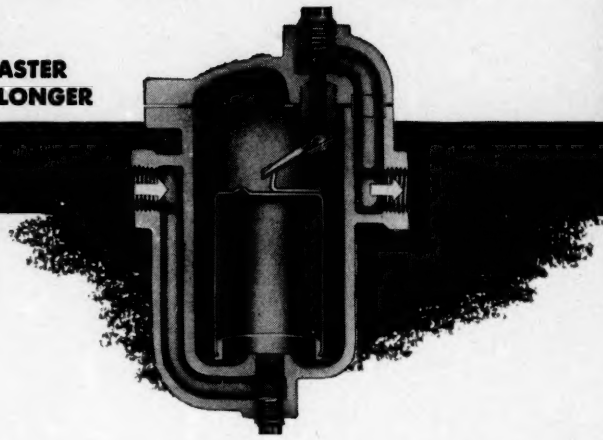
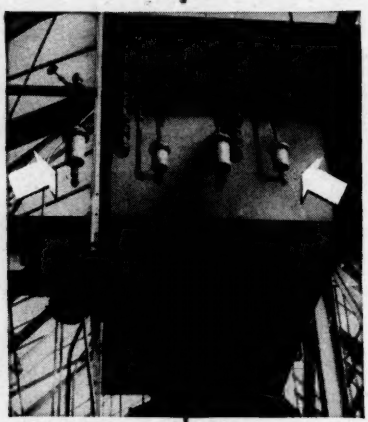
Here's the Trouble-Saving Trap for Low Pressure Vacuum Return Heating

IT GIVES YOU MORE HEAT, FASTER —AND LASTS LONGER



"50% REDUCTION IN STEAM TRAP MAINTENANCE since installing Armstrongs on 5 psi system with vacuum return."—*John Deere Ottumwa Works, Ottumwa, Iowa,*



"HEAT-UP TIME CUT 10%. Only $15.00 annual maintenance on 300 traps on low pressure vacuum return heating system." —*John Deere Harvester Works, East Moline, Illinois.*

ARMSTRONG inverted bucket steam traps are real *trouble-savers* on low pressure heating systems for these quickly understandable reasons:

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2. No Trouble with Corrosion — air and CO_2, particularly in unit heater coils, cause serious corrosion. Every time an Armstrong trap opens there is a momentary pressure drop that "pumps" air down to the trap where it is discharged along with condensate.

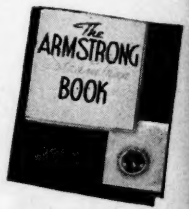
3. No Trouble Getting Fast Heat-up — Armstrong traps quickly draw off air that retards heat-up. Where large amounts of air are encountered when steam is turned on, traps with big thermically-operated bucket vents are available with capacity to handle 500 to 1500 cu. ft. of free air per hour.

4. No Trouble Keeping Heating Units HOT — Armstrong traps discharge condensate *at steam temperature* as fast as it accumulates. This keeps heaters packed with hot, dry steam for top BTU output.

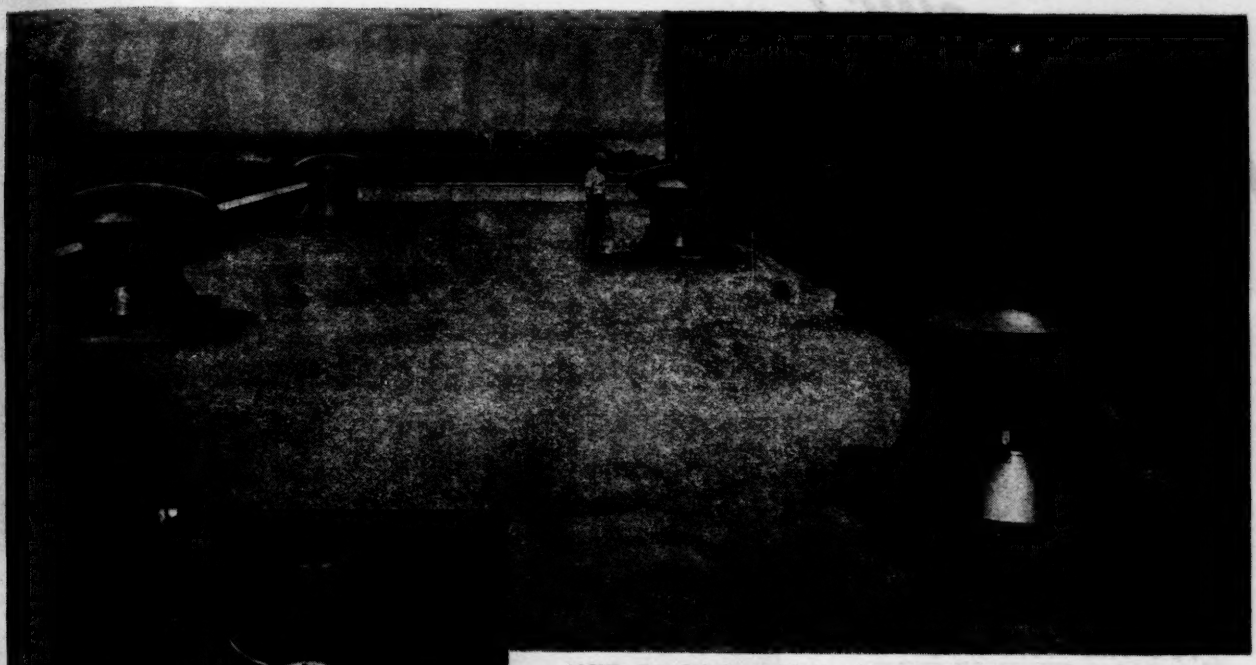
5. No Trouble with the Traps — There is nothing to stick, clog, leak or collapse in an Armstrong trap. The hardened chrome steel valves and seats in traps for heating service are identical in design, workmanship and materials to those in Armstrong traps for service at 1500 psig, 900°F. Interior trim is corrosion-resistant 18-8 stainless. No wonder they last so long with so little attention!

Armstrong traps are guaranteed to give you satisfaction or your money will be refunded. They are guaranteed against defects *forever.* Call your local Armstrong Representative for the traps you need now. ARMSTRONG MACHINE WORKS, 846 Maple Street, Three Rivers, Michigan.

SEND FOR THE 36-PAGE STEAM TRAP BOOK FOR COMPLETE DATA



ARMSTRONG STEAM TRAPS



ABOVE: Four DeBothezat 36" Power-Flow Roof Ventilators at Tanners Creek generating station of Indiana & Michigan Electric Co., member of the American Gas and Electric System. Low, streamlined design blends with modern building design. LEFT: Three DeBothezat 6' Vent Sets mounted on a 45° angle.

HOW Controlled Ventilation

SERVES 300,000-kw TANNERS CREEK POWER PLANT

Keeping the air free from coal dust and fumes could have been a serious problem in the Tanners Creek plant. But, here's how the problem was averted:

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THREE DeBOTHEZAT 6' VENT SETS with 60 HP motors were also installed. These operate at 700 RPM, each supplying 100,000 CFM of fresh air at 1½ inches S. P. and blowing it to the basement through a vertical shaft. From the basement, air is distributed throughout the boiler and turbine room areas. Eight DeBothezat 48" Vent Sets and two 36" Vent Sets (not illustrated) supply air to various local spots.

If you have problems of air supply or fume removal, let DeBothezat engineers recommend the most practical, efficient solution.

DeBothezat Power-Flow Roof Ventilators available with fan wheels 12" through 48" in diameter for use with or without duct systems.

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DeBothezat Vent Sets available with fan wheels from 18" to 6' in diameter.

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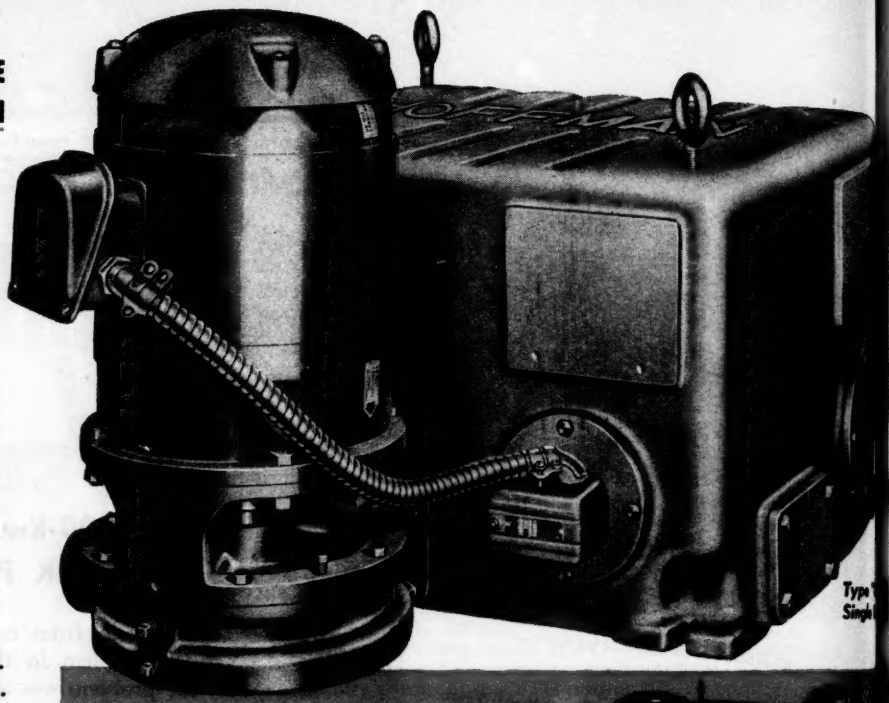

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3. Stainless steel impeller hub.
4. Renewable bronze wearing ring.
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8. Heavy cast iron receiver.
9. Heavy duty float control, seamless copper float and brass rod.
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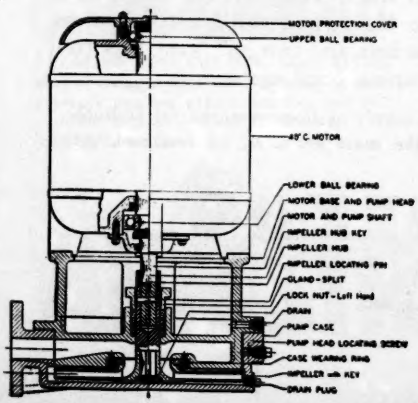
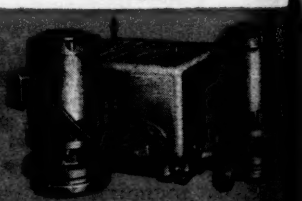
11. No piping between pump and receiver.
12. Float switch adjustable to various water levels.
13. Rigid motor support, very quiet.
14. Threaded outlet on pump cover to provide drainage and eliminate base with drip lip.





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All together, these pumps are a sure combination of sound design, excellent workmanship. Units are shipped ready for connecting to the [illegible]

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HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

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CLIFFORD STROCK

Associate Editors
NATHAN N. WOLPERT
WILLIAM B. FOXHALL

Technical Consultant
T. W. REYNOLDS

Advertising Staff

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GEORGE G. TURNER
228 North La Salle Street.

New York
HARRY J. TWINE
148 Lafayette Street.

Cleveland
EDWARD B. McENTEE
17115 Hillsboro Road.

Los Angeles
ROBERT H. DEIBLER
2506 W. 8th Street.

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President
ROBERT B. LUCHARS

Vice-President and Treasurer
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HEATING & PLUMBING EQUIPMENT NEWS
and technical books.

THIS MONTH'S COVER

A workman prepares a prefabricated radiant heating coil header at the shop of the Atlantic Pipebending and Fabricating Corp., Edgewater, N. J. This photo and those in the article beginning on page 90 are by Carroll Andariese of Hohokus, N. J.

Washington News

LORING F. OVERMAN

WITH increasing frequency, business paper editors find it advisable to journey to Washington to discuss the subject of "what now" with top brass of the Administration and the defense controls planners.

Most recent of these conferences, concluding shortly before press time for this column, included a stop at the President's office, a panel session with four political leaders from Capitol Hill, reports from Economic Stabilizer Roger L. Putnam and Defense Production Administrator Manly Fleischmann, and an interview with a Presidential aspirant, Senator Robert L. Taft.

Seldom has a group with more divergent viewpoints been assembled for a series of business interviews. Yet from each segment of the Washington group comes the clear-cut conviction that things are going to get a lot worse, economy-wise, before they get better.

At the White House

At the White House the President's 30-inch globe was used to demonstrate that, for the first time in history, this country could be reached in hours by hostile planes flying over the polar cap to strike at Detroit, Chicago, and other industrial cities in the northern boundary states. The President's lesson in geography also pointed out how the have-not nations press the democracies at other key points throughout the world. Also pointed out on the President's globe were plateaus and valleys where the have-not millions live precariously in the midst of undeveloped plenty.

The inference was unmistakable. World peace is to be dependent, as the Administration sees it, upon investing unestimated billions of American dollars in developing the resources of the have-nots in all parts of the world. Some hint of this thinking was evident in the President's request for $5 billion in additional taxes—some of it to improve "social conditions" both here and abroad.

A Contrary View

Strange as it may seem, the final question asked of Senator Taft in an interview which immediately preceded the visit to the White House, was, "How do you answer the criticism that you are still, in fact, an isolationist?" His answer points up the striking difference between the thinking of Mr. Taft and Mr. Truman.

Senator Taft observed that the question could best be answered by reading his recently-published book, but that he would try to comment on the question briefly. He conceded that it would be necessary to make some provision for financing rehabilitation and development overseas, but said he felt that the amount should be the minimum consistent with maintenance of our own financial stability. He indicated that he felt that our 6% of the world's population could neither expect to rule nor support the other 94% by pouring out our treasure.

Which of these views is the correct one—that of the President or the Presidential Aspirant—remains to be seen.

Meanwhile—Squeeze

Meanwhile our entire economy is being keyed to the idea that somebody doesn't like our efforts to rehabilitate the have-nots, so that we'd better equip both ourselves and the have-nots to fight that somebody if necessary.

Defense Production Administrator Manly Fleischmann said that the materials pinch is yet to come, and that its initial effects are just beginning to be felt in such areas as the Detroit automotive industry and New York residential and commercial building. In those fields, the first of many, the production piston has stopped on the dead center of transition. Unemployment is to be the result pending retooling in the automotive industry, and commercial construction workers in metropolitan areas where work is not primarily industrial will have its bad times until further notice.

During the year ahead, Mr. Fleischmann said, the shortage of structural steel will limit building to military facilities, defense-related industrial expansion, and essential civil industrial structures. Commercial building is to be virtually taboo, and the cut in scarce materials available for residential building has been to 40% of previous averages. This does not necessarily mean that total residential building will decline to that level, Mr. Fleischmann said, since ingenuity will probably substitute other materials for those in short supply.

Nevertheless, the DPA spokesman said that 95% of the expansion projects should be completed and in operation by the end of 1953, with all projects due to be completed late in 1954. As of December 21, 1951, DPA had issued certificates of necessity for 5,443 new or expanded facilities having a total value of $11.5 billion. The largest single project is that for steel expansion. The total reported cost for steel works and rolling mills is $2.06 billion with $339 million for blast furnaces. The steel works and rolling mill program was estimated as 41% complete as of December 31.

Another top priority program—primary refining of aluminum—was estimated at only 27% complete by the end of the fourth quarter. The aircraft group and the expansion of plants to refine petroleum were reported as one-third complete.

It may be assumed that completing the facilities program will begin now to draw heavily on the products of the heating, ventilating, air-conditioning and plumbing industries. DPA figures indicate that 31% of the facilities expansion costs are for construction; 3% for land and overhead, and 66% for machinery and equipment.

In this latter figure—the equipping of defense facilities and essential civilian industrial construction—will lie the market of the readers of this publication until the residential and commercial fields are permitted to resume. At that time, however, readers of this column may find that the giant new defense facilities have become a voracious Frankenstein monster bent upon consuming for military use the majority of the metals available. Although the defense planners anticipate that the new steel and aluminum facilities will permit military needs to be superimposed upon the civilian structure, whether things work out that way remains to be seen.

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It would seem the better part of valor for metals users —during this period of transmission between the creation of the defense plant and the feeding of same—to make every possible effort to be on the list of those who hold defense contracts "when comes the revolution".

What to Expect

Just how long it takes for a defense order to become a delivered weapon is stressed in the fourth quarter report of Defense Mobilizer Charles E. Wilson. Citing the B-47 jet bomber as an example, Mr. Wilson pointed out that it required two years for design, two more years to reach the final test stage, and two more years to start assembly line production.

"On the long lead-time items," said Mr. Wilson, "the deliveries we are getting now are from orders placed before the attack on Korea. Not a single plane that was not in production before Korea has been used yet in combat there. The bulk of the orders for new weapons reached industry in March or April of 1951. We are not seeing today, nor will we until late 1952, the results of that order placement.

Counselling against any early hope of a slackening in the demand for scarce materials, Mr. Wilson revealed that a current re-examination of military goals will not result in cutbacks, but may result in increases. The higher goals, he said, will probably involve long lead-time items such as aircraft, atomic energy and electronic equipment.

Atomic Implications

Closely following Mr. Wilson's predictions of possible increases in the atomic weapons program came verification from Senator McMahon (Dem., Conn.), one of the foursome of politicians mentioned earlier in this column. Others on the political panel were Senators Douglass, Brewster and Duff. Although he did not discuss the atomic program at the political panel, Senator McMahon (Chairman of the Congressional Joint Atomic Energy Commission) later revealed that expansion of the program is contemplated.

Legislation Asked

To implement the controls programs just getting into action, President Truman has asked Congress to extend the Defense Production Act for two more years, and to increase taxation by at least $5 billion a year to help foot the bill. There seems little doubt that the Defense Act will be extended, but for the record many members of Congress are promising that there will be no tax increase. At the political panel session previously referred to, one of the Senators revealed that the secret of lasting political success in Washington is to "Speak in favor of economy, vote for every appropriations bill, and against every tax bill."

In-Put, Out-Put Studied

There's a lot of talk in Washington about a new plan of determining with greater accuracy the component requirements of the defense program and essential civilian programs during the third quarter of 1952. Extremely controversial is a plan put forth by William C. Truppner, assistant administrator of DPA for Production and Distribution Controls. A new form to be the basis for determining these requirements has been submitted to the Bureau of the Budget for approval, and Mr. Truppner has said he hopes the forms will go out to about 6,500 plants in 150 product codes sometime in February.

If the present plan is followed, manufacturers of end products will be asked to tell DPA the dollar value of components which go into the making of a given end product. The component manufacturer in turn would be asked to state the dollar value of metals by controlled materials forms and shapes which would be used in a given dollar value of components. These figures would then be translated by DPA into terms of metals, and a series of ratios established which would indicate the number of components needed to support a given level of end product, and the amount of metal needed.

It is also held that the new system of materials analysis would simplify the scheduling of production of important components. DPA people explain that two changes would improve the defense program. The first is to know what components are required to make a single tank or plane or a refrigerator. The next requirement is to determine the timing of component production so that, for example, a finished engine is ready and waiting when the airframe is ready to receive it.

DPA's interest in an improved system of scheduling proves again that a few controls father the need for more. For the moment, DPA people are hoping, they say, that it will not be necessary to go all out. Instead, they hope to cure lags with spot assistance directives.

Those who recall the operations of the old War Production Board, among them Charles E. Wilson, remember that the spot rearrangement of production schedules resulted in costly leap-frogging on order boards until a components scheduling program was developed. In other words, the trend toward all-out controls continues.

Washington Miscellany

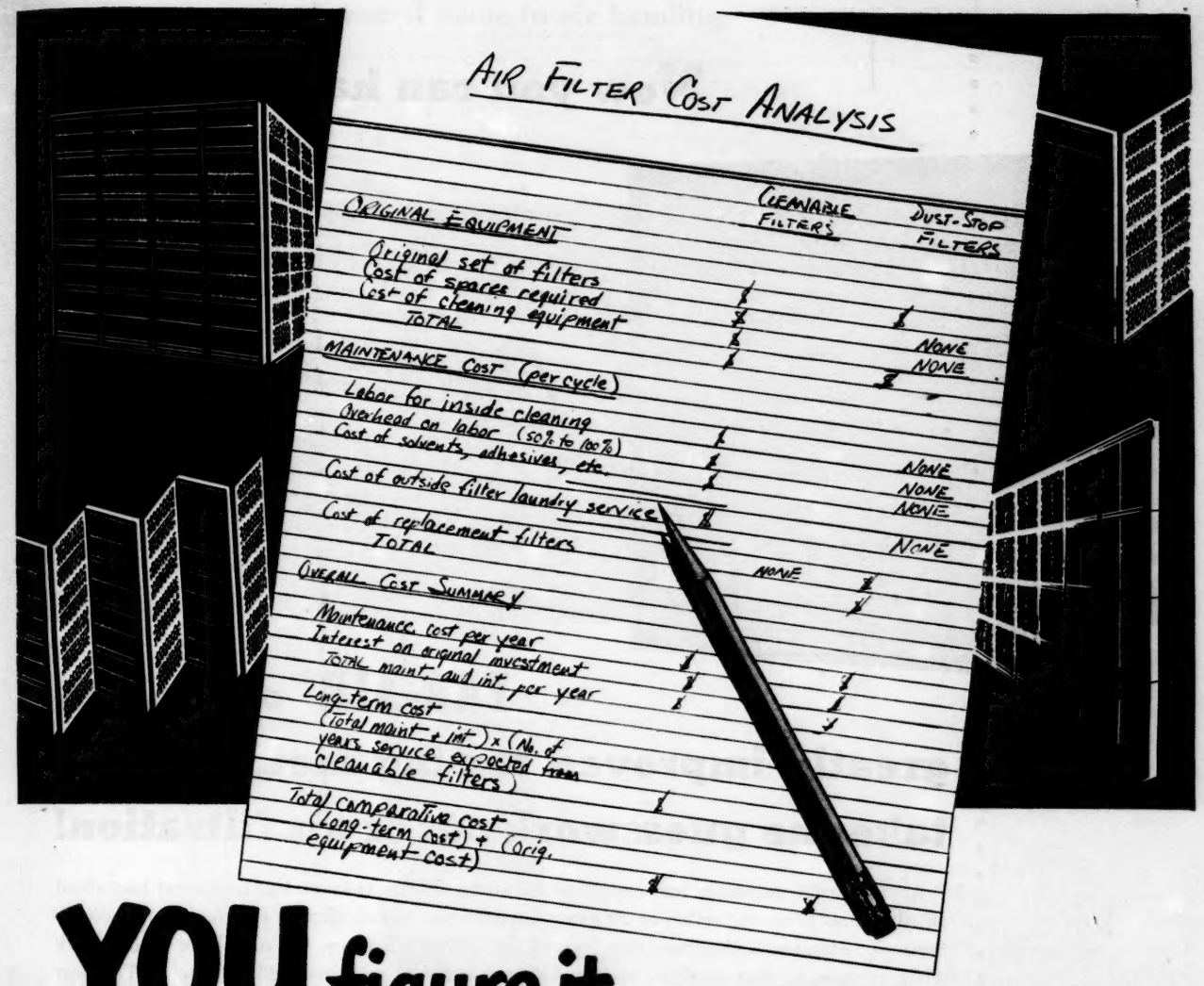
Nickel is Bottleneck: A nickel shortage which could hold back "must" programs from three to six months is upon us. Military and Atomic Energy Commission needs alone are for half a million pounds more nickel than is now available. A withdrawal of nickel from the stockpile is likely, pending negotiations to increase the supply from Cuba.

Scrap Needed: Because of lack of scrap steel and iron a newly-completed open hearth furnace at Peoria, Ill., failed to open on schedule. NPA is urging all industry to put scrap metals back into use through regular channels.

Award Data Released: Manufacturers interested in subcontracts will welcome the news that the Army Forces are restoring a policy of publishing information on all unclassified contracts in excess of $25,000. The information appears in a Synopsis of Contract Awards, available at field offices of the Department of Commerce.

Copper Short Until 1954: Defense Mobilization Chief Charles E. Wilson has announced that no help is in sight for the copper shortage before 1954. Any relief before that time, he said, must come through the substitution of aluminum for copper wherever possible. Efforts to increase production are being made through subsidy of marginal producers.

Assistance Clinics Scheduled: Assistance clinics in 14 cities, for the purpose of placing defense contracts with more than 3,000 manufacturers whose shortages of critical materials has forced them to lay off workers, have been planned by the National Production Administration.



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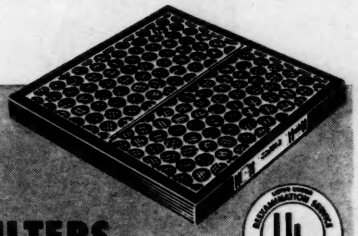

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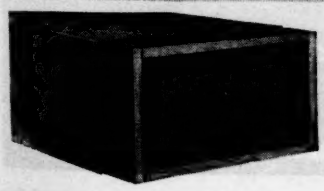

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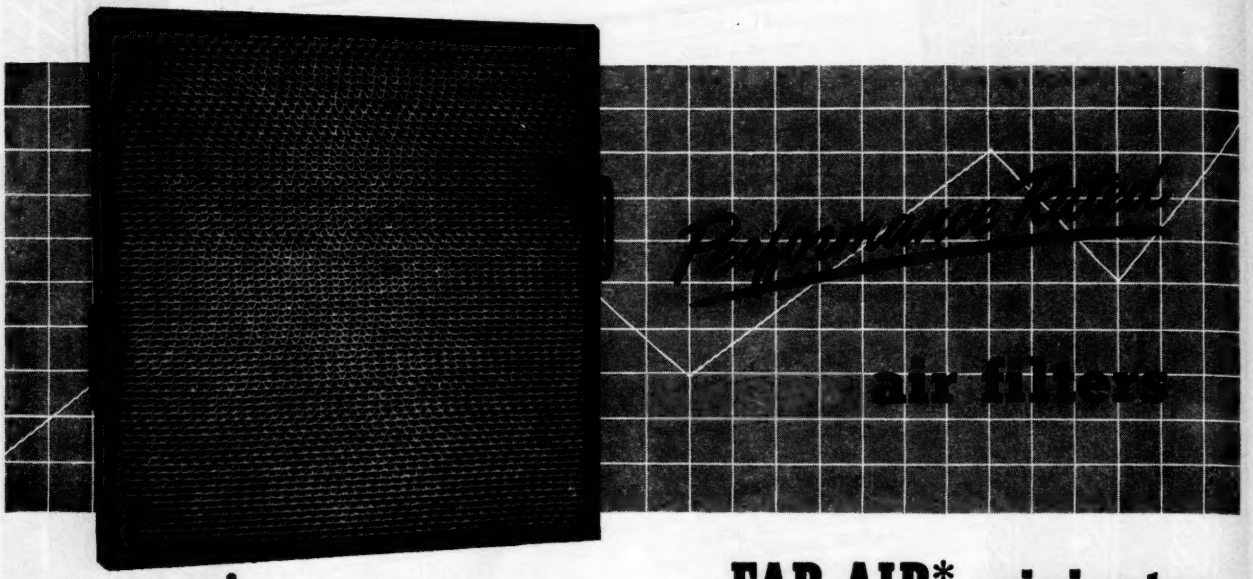

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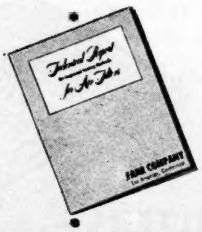

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America needs your daily pound of scrap

IF every man, woman and child in America provided one pound of scrap each day, they would supply just about enough to produce the 105 million tons or more of new steel that the industry hopes to make in 1952.

Like yeast in breadmaking, scrap is essential to steelmaking. Scrap speeds up the process because scrap is already-refined steel. Every ton of scrap used replaces one ton of pig iron. Thus scrap also saves raw materials, because each ton of pig iron represents two tons of iron ore, one ton of coal and half a ton of limestone.

The continuing co-operation of every reader of this page is urgently requested to overcome a scrap shortage daily growing more critical. Turn in--by selling your scrap to regular scrap-gathering channels--any and all broken, worn-out or obsolete things made of iron and steel--machines, tools, pipe, boilers, structural parts and other "junk" you'll probably never use again.

Do your part in the campaign to help meet America's need for more steel. Enlist now for the duration. Remember that the scrap you furnish may help you get more steel.

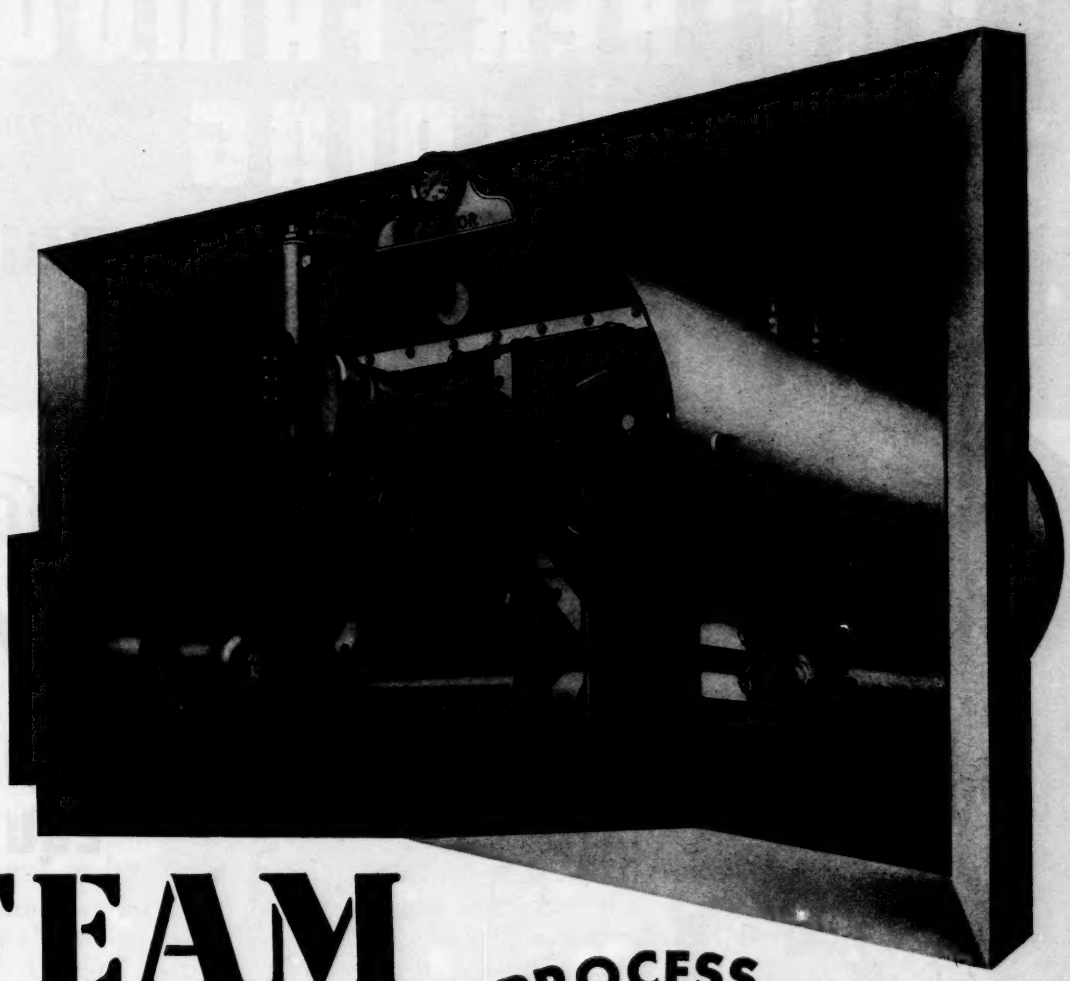
YOUR SCRAP YOUNGSTOWN IS NEEDED

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment



STEAM
FOR HEAT OR PROCESS

A complete steam plant whose heavy duty construction assures long-lived dependability throughout years of hard usage.

- One purchase, backed by undivided responsibility.
- Shipped completely assembled after factory tests to assure highest operating efficiency.
- More than 80% thermal efficiency guaranteed.
- 4-pass design provides ample heating surface . . . at minimum, 5 sq. ft. b.h.p.
- Built-in induced draft fans provide added safety and eliminate the need of an expensive chimney.
- Simple installation requires no special foundation.
- Clean, quiet operation.
- Burner equipment to suit your fuel; gas, oil or both.
- 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i., or for hot water heating.

If you are planning new or additional steam facilities, you'll want Catalog 419 which tells all you should know about packaged steam plants.

for performance you can **BANK** *on*

SUPERIOR
STEAM GENERATORS

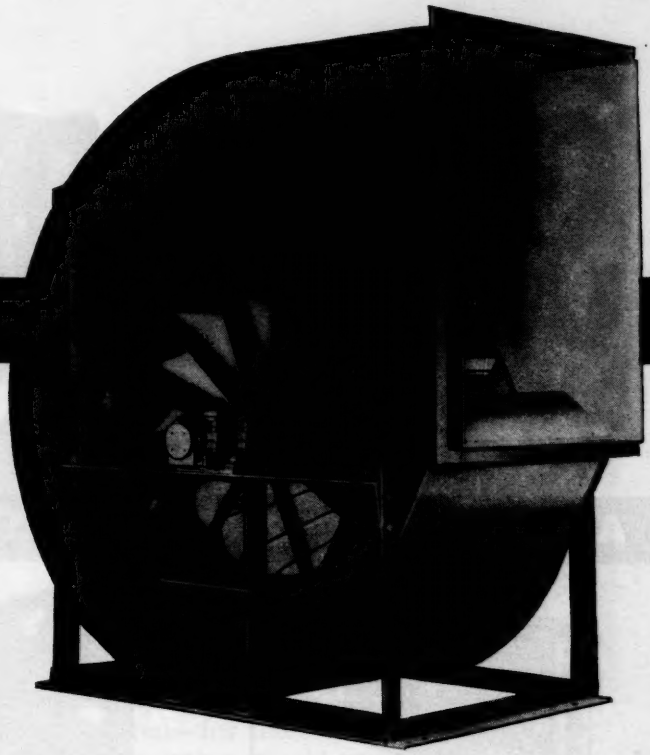
SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 18, N.Y.

ANOTHER FAMOUS BUILDING

"Buffalo"

AIR CONDITIONING EQUIPMENT

Right, "Buffalo" Limit Load Fan, most recommended for large ventilation jobs. Write for Bulletin 3737.



A fine example of modern commercial America is the outstanding 5th Avenue, New York, store of Best & Co., world-famous apparel store.

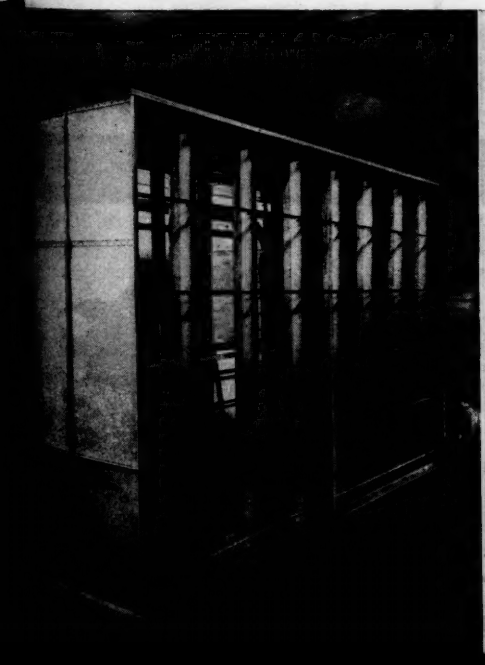
The forward-looking management of this store overlooked no detail in planning for the comfort of customers and employees. Small wonder "Buffalo" Fans and Air Conditioning Units were chosen — their reputation for long life, dependable and economical service has been proven for many years.

And comfort is just ONE of the important jobs being done by "Buffalo" Air Equipment! . . . Its value in defense, for instance, was established in many ways during World War II. Let us show you how many of your problems can be solved or controlled by "Buffalo" Air Equipment!

BUFFALO FORGE COMPANY

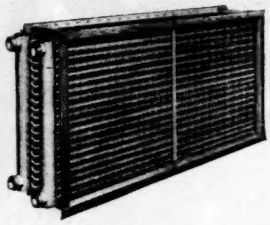
480 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities.

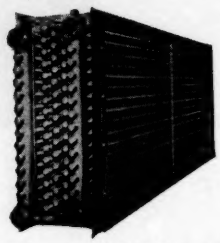


SMART DECISION!

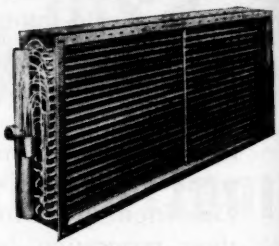
AIR CONDITIONING COILS



WATER COIL
For Cooling and Heating, 1 to 10 rows deep.

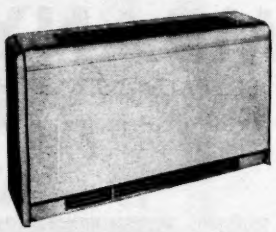


CLEANABLE TUBE WATER COIL
Removable Plug Type, 1 to 10 rows deep.

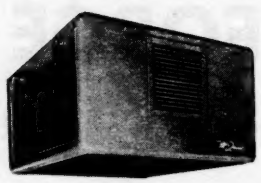


DIRECT EXPANSION COIL
For Cooling, 1 to 8 rows deep.

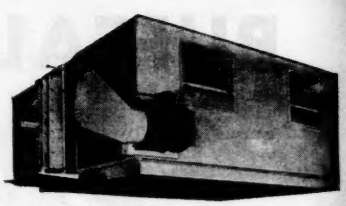
AIR CONDITIONING UNITS



SEASONMAKER—(FLOOR)
Also available in basic or ceiling types, 3 sizes 200 cfm, 400 cfm and 600 cfm.

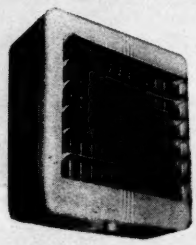


"RH" AIR CONDITIONER
2 to 10 Ton Models—For use with hot or cold water, steam or direct expansion in small commercial applications.

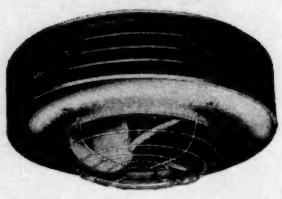


(SUSPENDED MODEL)
AIR CONDITIONER
Type "A" Central Station Air Conditioners for large industrial and commercial applications.

UNIT HEATERS



HORIZONTAL UNIT HEATER
Nominal Capacity range 20,300 to 360,000 Btu's.

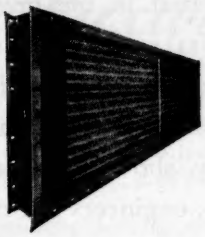


DOWN FLOW UNIT HEATER
Nominal Capacities from 25,400 to 500,000 Btu's.

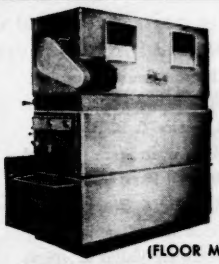
(SUSPENDED MODEL)
BLOWER TYPE UNIT HEATER
Nominal Capacities from 20,600 to 1,600,000 Btu's.

SPECIFY McQuay

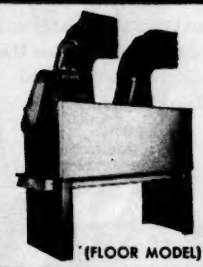
TO INSURE CUSTOMER SATISFACTION



"BLAST" HEATING STEAM COIL
For Heating, 1 or 2 rows deep, using low or high pressure steam.



(FLOOR MODEL)
AIR CONDITIONER
Type "A" Central Station Air Conditioners for large industrial and commercial applications.



(FLOOR MODEL)
BLOWER TYPE UNIT HEATER
Nominal Capacities from 20,600 to 1,600,000 Btu's.

Proved and Preferred!

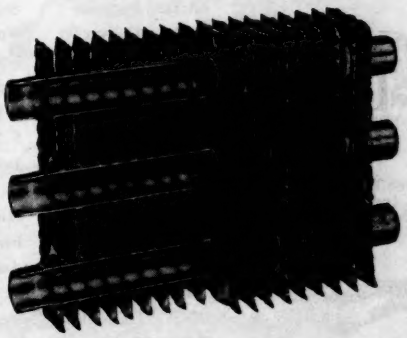
You, and your customers too, are money ahead when you specify McQuay . . . because McQuay products are proved and preferred—for their efficiency, economy of operation, and the way they stand up under long hard use.

Join the growing list of architects, engineers and contractors who depend upon McQuay to satisfy all of their heating and air conditioning requirements. Quality and price comparisons will convince you that it pays to specify from McQuay's complete line—pays in profits from the job and in customer satisfaction.

NEW RIPPLE-FIN COIL CONSTRUCTION

Only McQuay gives you Ripple-Fin surface—the product of years of research aimed at producing the ultimate in heat transfer for any weight of metal. High efficiency is assured by forcing the air to follow an ever-changing direction of flow in passing through the coil. Thus air repeatedly contacts coil surface to give maximum contact time, maximum contact velocity, and a resultant optimum heat transfer.

With this advance in design, McQuay retains the staggered tube and the McQuay rippled edge features so well known in the industry, and which contribute greatly to higher heat transfer, construction ruggedness, and eye appeal.



McQuay INC.

HEATING
AIR CONDITIONING
REFRIGERATION

1619 BROADWAY STREET, N.E. • MINNEAPOLIS 13, MINNESOTA

Sarco Dependability Assures

Comfort Heating to HOSPITALS from Coast to Coast

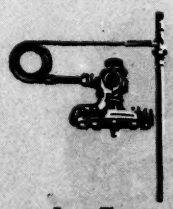
Sarco Type H Radiator Trap

Sarco No. 1141 Radiator Valve

Sarco Type FT Float-Thermostatic Trap

Sarco Type BM S Inverted Bucket Trap

Sarco Pipe Line Strainer



Sarco Type 24-30 Temperature Regulator

Citizens General Hospital, New Kensington, Pa.

Sarco is taking a prominent part in the present active hospital construction and expansion program. Orders coming from every section of the country show that Sarco specialties enjoy national acceptance by hospital architects, engineers and contractors for heating, kitchen and hospital equipment, and temperature control for water heaters. Ask for catalog 200-3.

A few of the Hospitals for which Sarco specialties have been ordered during the last year.

State	*City*	*Hospital*
Ariz.	Phoenix	St. Joseph's Hospital
Colo.	Denver	Veterans Administration Hospital
Conn.	Derby	Griffin Hospital
Conn.	Norwich	Norwich State Hospital
Conn.	Willimantic	Windham Community Memor.
Fla.	Tampa	S. W. Fla. T.B. Sanatorium
Ga.	Monticello	Jasper County Hospital
Idaho	Boise	St. Adolphus Hospital
Ill.	Chicago	Michael Reese Hospital
Ill.	Evanston	Evanston Hosp.–Bldgs. A, B & C
Iowa	Audubon	Audubon County Hospital
Iowa	Cedar Rapids	St. Lukes Hospital
Ky.	Louisville	Veterans Administration Hospital
Mich.	Detroit	Receiving Hospital
Minn.	Fort Snelling	Veterans Administration Hospital
Minn.	Redwood Falls	New Hospital
Md.	Cheverly	Prince Georges County Hospital
Miss.	Hazelhurst	Copiah County Hospital
N. J.	Newton	Newton Memorial Hospital

State	*City*	*Hospital*
N. J.	Secaucus	Hudson County Hospital
N. Y.	New York City	Beth El Hospital
N. Y.	New York City	E. Bronx T. B. Hospital
N. Y.	Beacon	Matteawan State Hospital
N. Y.	Buffalo	Roswell Park State Hospital
N. Y.	Ithaca	Herman M. Biggs Memorial
N. Y.	Utica	Utica State Hospital
N. Y.	Walton	Delaware Valley Hospital
Ohio	Ashtabula	Ashtabula General Hospital
Ohio	Dayton	St. Elizabeth's Hospital
Pa.	Danville	Danville State Hospital
Pa.	Embreeville	Embreeville State Hospital
Pa.	New Kensington	Citizens General Hospital
Tex.	Corpus Christi	Corpus Christi Memorial Hospital
Tex.	Denton	Flow Memorial Hospital
Va.	Suffolk	Louis Obici Memorial Hospital
Wash.	Seattle	Veterans Administration Hospital
Wis.	Madison	Madison General Hospital
Wyo.	Buffalo	Buffalo Hospital

356

SARCO COMPANY, INC.

EMPIRE STATE BUILDING • NEW YORK 1, N. Y.

Represented in Principal Cities

SARCO CANADA LTD., TORONTO 8, ONTARIO

ALWAYS SPECIFY SARCO

Sarcotherm
Modulating Heat Control

Selected for

SMOKE RISE
Luxury Homes

Ninety-one distinctive, custom built homes have been completed in this exclusive club development comprising 5000 acres of unspoiled country near Butler, New Jersey, 30 miles northwest of New York.

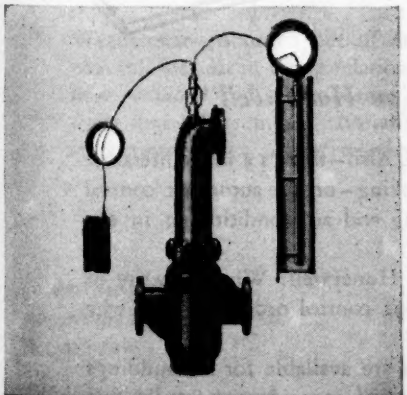
Prominent among outstanding modern improvements built in by the architect, Carl Kemm Loven, A.I.A., of Glen Rock, N. J., is the extensive use of

RADIANT HEATING

with Sarcotherm Control, thus assuring complete comfort for the occupants under all weather conditions.

For full information ask a Sarcotherm engineer to see you —there is one near you—or write for complete catalog.

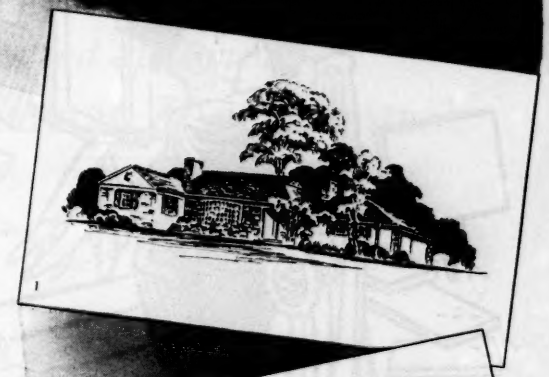
SARCOTHERM CONTROLS, INC.
Empire State Building, New York 1, N. Y.
A SARCO PRODUCT



The heart of the Sarcotherm control system of forced hot water or radiant heating is this unique control valve. It is actuated by liquid expansion thermostats, one located outside the building and one in the valve itself. Between them they vary the proportion of system water re-circulated, to maintain the desired room temperatures.

The Sarcotherm Comfort Control Thermoray is an extremely sensitive thermostat affected by both radiation and convection.

While designed for radiant heating, it is equally effective controlling circulating pumps, motorized valves, or electrically heated panels.



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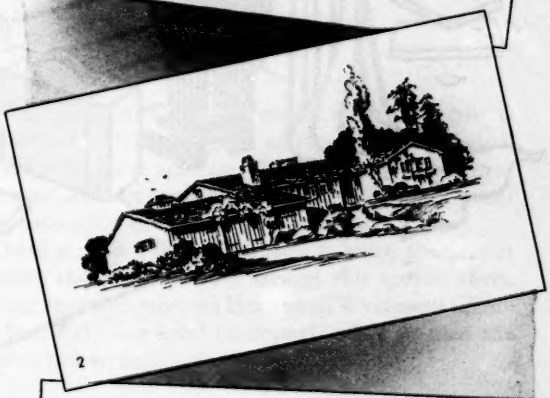


2

3

Three typical residences at Smoke Rise, designed by Carl Kemm Loven, A.I.A., Architect:

1. **William Nicholson III**
2. **Douglas Weller**
3. **John D. Foley**

21

". . . and for the temperature control, we'll insist on Honeywell"

Sure looks like cartoonist Tom Henderson's couple are rushing things. But "newly marrieds" are often like that!

It's hard to tell how their home will look, but it's a certainty it will be blissfully comfortable for, after consulting their heating engineer, they wisely decided to insist on Honeywell controls. Heating engineers and contractors know from past experience that the way to get *better* temperature control is to use Honeywell.

If *you* have a control problem, Honeywell can help you provide the proper thermal environment for any client – anywhere – in any kind of structure.

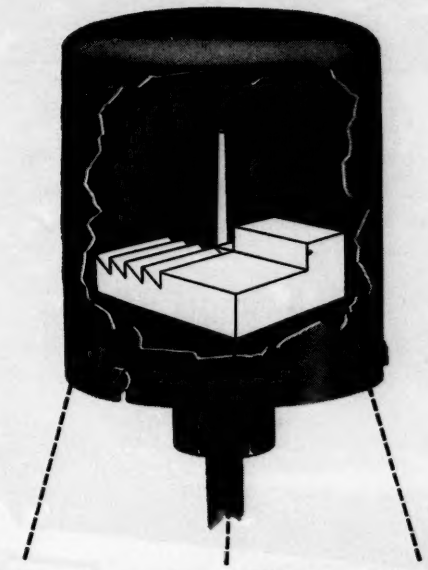
A large staff of expert control engineers – in 91 different Honeywell offices across the nation – specialize in doing just that. Also – there's a lot of literature that's yours for the asking – on the automatic control of heating, ventilating and air conditioning in any type of building.

So why not talk to Honeywell? Why not write to Honeywell about your control problem? And why not do it *now?*

Honeywell controls are available for all buildings – large, small, commercial or residential. See the facing page which gives interesting facts about one of these fine Honeywell controls.

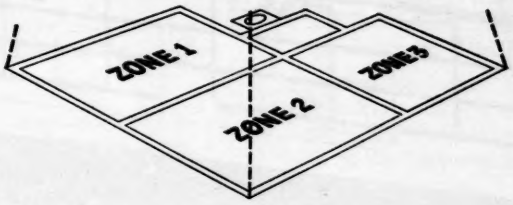
H HONEYWELL

For help with any control problem, talk to Honeywell



. . . and for factories, offices and apartments

Specify Honeywell Weatherstat Zone Control



Provides greater comfort . . . saves on fuel!

When you specify Weatherstat Zone Control for commercial buildings, you actually *increase* the efficiency of that building's automatic heating system. Weatherstat – the only outside control system of its type – achieves its remarkable accuracy by metering heat not only in relation to outside temperatures, but to *wind and sun conditions as well!*

Here's how Weatherstat Zone Control works. Your building is divided into zones according to *exposure, occupancy* and *construction.* Each zone has its own Weatherstat – mounted out-of-doors. These Weatherstats call for heat in direct relation to *wind, temperature, solar radiation* and *to the heating requirements of the different zones.* This means constant, comfortable inside temperatures, *regardless of weather!*

Weatherstat Zone Control prevents wasteful overheating, too – which makes great savings of fuel possible.

This finer, more accurate Weatherstat system *costs no more* than ordinary control systems. Usually one control takes care of an entire side of a building.

These are just a few of the facts to show the greater comfort and potential fuel savings this system offers. Get the complete story on Honeywell Weatherstat Zone Control. Call your local Honeywell office or mail the coupon below, today.

MINNEAPOLIS **Honeywell**

First in Controls

. . . and for help with the temperature control, we'll talk to (your firm name)

FREE! Personalized cartoon. For your 8½" x 9" reproduction of this Henderson cartoon (incorporating the name of your firm), fill out and mail coupon today.

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HV-2-49, Minneapolis 8, Minnesota

Gentlemen:

☐ Please send me your booklet on Weatherstat Zone Control.

☐ Please send me a free, personalized reproduction of the Henderson cartoon.

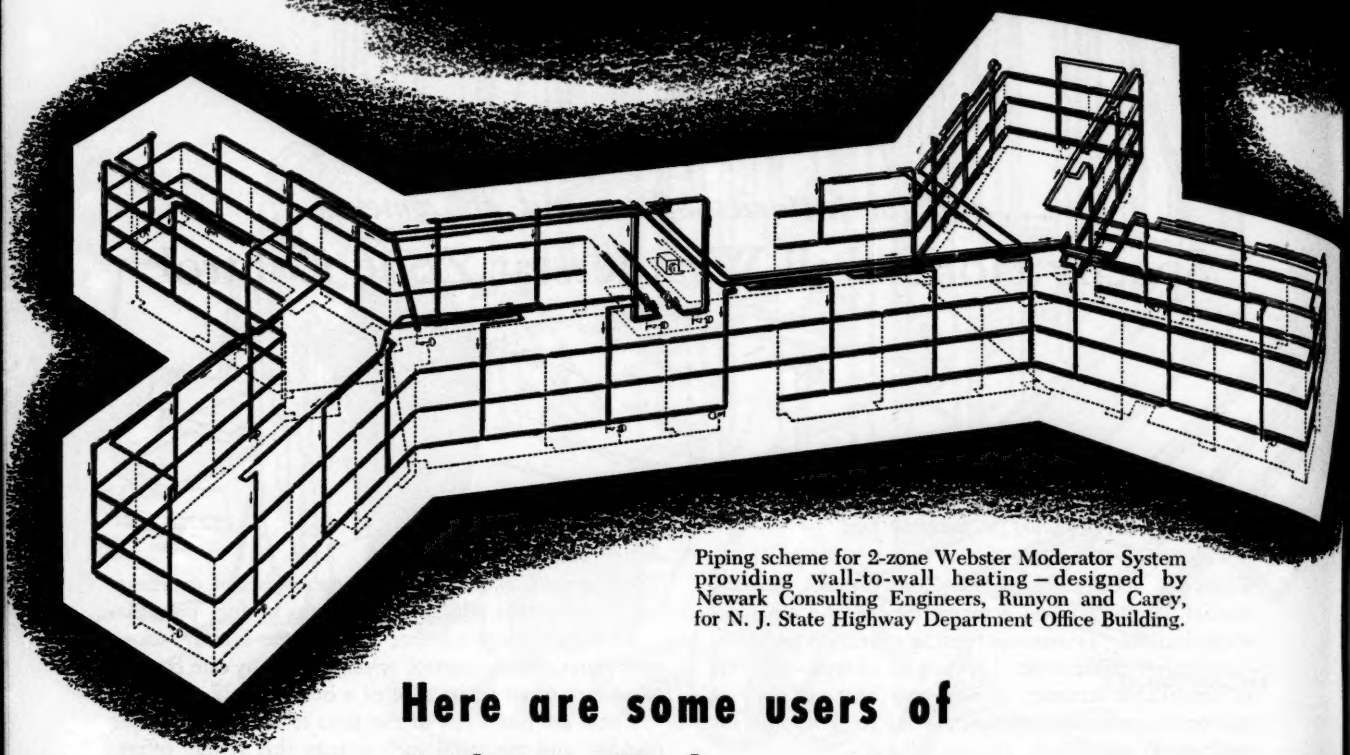
Name_____

Firm Name_____

Address_____

City_____ Zone_____ State_____

fuel savings



Piping scheme for 2-zone Webster Moderator System providing wall-to-wall heating – designed by Newark Consulting Engineers, Runyon and Carey, for N. J. State Highway Department Office Building.

Here are some users of Webster Moderator Systems

ARKANSAS
Crittenden County General Acute Hospital, West Memphis

CONNECTICUT
Aetna Fire Ins. Co., Hartford
Electric Light Co., Hartford
Fawcett Building, Greenwich
Hartford Hospital, Hartford
National Fire Ins. Co., Hartford
Phoenix Fire Ins. Co. Bldg., Hartford
Timothy Dwight Coll., Yale U., New Haven
Travelers Ins. Co., Hartford

DELAWARE
Delaware Hospital, Wilmington

DISTRICT OF COLUMBIA
Georgetown Univ. Hosp., Wash.

GEORGIA
Athens General Hospital, Athens
County Club Apts., Augusta
Emory University, Atlanta
Macon Hospital, Nurses' Home, Macon

ILLINOIS
Commonw. Edison Serv. Bldg., Chg.
Butler Brothers, Chicago
St. Francis Hospital, Kewanee
Sacred Heart Mission Sem., Geneva

INDIANA
Gibson Building, Indianapolis
Fletcher Trust Bldg., Indianapolis
Wm. H. Block Company Department Store, Indianapolis
Lincoln Bank Tower, Fort Wayne

IOWA
Equitable Life Building, Des Moines
Lexington Apts., Des Moines
Securities Building, Des Moines
Western Union College, Le Mars

LOUISIANA
Goodwood Elem. Sch., Baton Rouge
Louisiana State Univ., Baton Rouge
St. Agnes Elem. Sch., Baton Rouge
Wohl Apartments, New Orleans

MARYLAND
U.S. Printing and Lithographing Company, Baltimore
Lexington Building, Baltimore
Calvert Building, Baltimore
5th Regiment Armory, Baltimore
Hearst Tower Building, Baltimore

MASSACHUSETTS
75 Federal Street, Boston
Mt. Holyoke Coll., South Hadley
Monarch Life Ins. Co. Bldg., Springfield
Hotel Touraine, Boston

MICHIGAN
Wardell Sheraton Hotel, Detroit
C.I.O. Union Bldg. Corp., Detroit
Marygrove Coll., Immaculata Faculty Bldg., Detroit
Standard Accident Ins. Co., Detroit
Wolverine Hotel, Detroit
Central Michigan Community Hospital, Mount Pleasant

MINNESOTA
Rand Tower, Minneapolis
Health Center, Rochester
Zumbro Hotel & Colonial Hospital, Rochester
Medical & Surgical Bldg., Rochester
Minneapolis Athletic Club, Minneapolis
Great Northern Railway Co., St. Paul
Foshay Tower, Minneapolis
First Nat'l Bank Bldg., Rochester
Farmers & Mechanics Savings Bank, Minneapolis
Crosier Fathers Monastery, Onamia
Andrews Hotel, Minneapolis

LAN

...flexible and comfort-producing . . .

—*simple because there are just four control elements for each zone. The balancing of the system is done from the heating plan by the accurate sizing of Webster Metering Orifices in radiator supply valves.*

—*flexible because each system is "tailor-made" for the building in which it is installed. Each section of the building receives the desired amount of heat. Shut off a single room or an entire floor and the system automatically compensates for the decreased demand.*

—*comfort-producing because the Webster Outdoor Thermostat speeds up the delivery of heat when the outdoor temperature falls and slows down the delivery when the outdoor temperature rises.*

You can heat it *better* (greater comfort, reduction of overheating and underheating) and at lower cost with a "Controlled-by-the-Weather" Webster Moderator System.

That's the conclusion of architects, engineers and contractors who have specified or installed the Webster Moderator System in thousands of steam-heated buildings since 1928.

Building owners and managers have fuel savings records to prove the soundness of the heating plans. For example:

An office building cut steam consumption $5,671 in three years . . . A new hospital used 18% less steam than the conservative engineering estimate . . . A group of 14 university buildings cut heating costs $9,500 in 12 months . . . An apartment building saved $567 in the first year.

A heating plan that includes a Webster Moderator

A group of five bulletins gives complete information on the Webster Moderator System. Write for your set today.

Address Dept. HV-2

WARREN WEBSTER & COMPANY

Camden 5, N.J. Representatives in Principal U.S. Cities : : *In Canada, Darling Bros., Limited, Montreal*

MISSISSIPPI
Mississippi State College
Marion County Hospital, Columbia
Jackson Co. Crt. Hse., Pascagoula

NEBRASKA
Insurance Building, Omaha

NEW HAMPSHIRE
Mary Hitchcock Hosp., Hanover
St. Anselm's College, Manchester

NEW JERSEY
Prudential Insurance Co., Newark
Mutual Ben. Life Ins. Co., Newark
Presbyterian Hospital, Newark
N. J. Mfrs'. Assn. Bldg., Trenton

NEW YORK
Saks Fifth Avenue, N. Y. C.
Queensbury Hotel, Glens Falls
Corning Co. Bldg., Corning
Democrat & Chronicle Bldg., Rochester
Engineering Building, Rochester
Herald Building, Rochester
Municipal Airport Admin. Bldg., Rochester
Neisner Bros. Office Bldg., Rochester
Port Authority Bus Term., N. Y. C.
Skidmore Coll., Saratoga Springs
Eastern N. Y. Orthopedic Hosp., Schenectady
Genesee Building, Buffalo
Hearn Department Store, New York
Cooperative GLF Building, Ithaca
Card. Hayes Mem. High School, N.Y.C.

NORTH CAROLINA
E. Carolina Teachers' Coll., Greenville
Edenton Hospital, Wilson
Wake County Office Bldg., Raleigh
North Carolina State Coll., Raleigh

NORTH DAKOTA
Pioneer Mut. Life Ins. Co., Fargo

OHIO
Passenger Station, Big Four Railroad, Springfield
Hanna Building and Annex, Cleveland
Hotel Cleveland, Cleveland
Cleveland Pneum. Tool Co. Off. Bldg.

PENNSYLVANIA
Hess Bros. Dept. Store, Allentown
Pa. State Capitol Group, Harrisburg
Hotel Hershey, Hershey
Westinghouse Bldg., Phila.
Bellevue-Stratford Hotel, Phila.
Union Trust Building, Pittsburgh
Penn Mutual Life Ins. Co., Phila.
Masonic Temple, Pittsburgh

SOUTH CAROLINA
Clemson College, Clemson
S. C. Baptist Hospital, Columbia

SOUTH DAKOTA
Huron Clinic, Huron

TENNESSEE
E. Tenn. Tuberc. Hosp., Knoxville
Eastern State Hospital, Knoxville
Hamilton Co. Mem. Hosp., Chattanooga
Holston Valley Community Hospital, Kingsport
Tenn. Copper Co., Off., Copper Hill

VERMONT
Barre City Hospital, Barre
Heaton Hospital, Montpelier

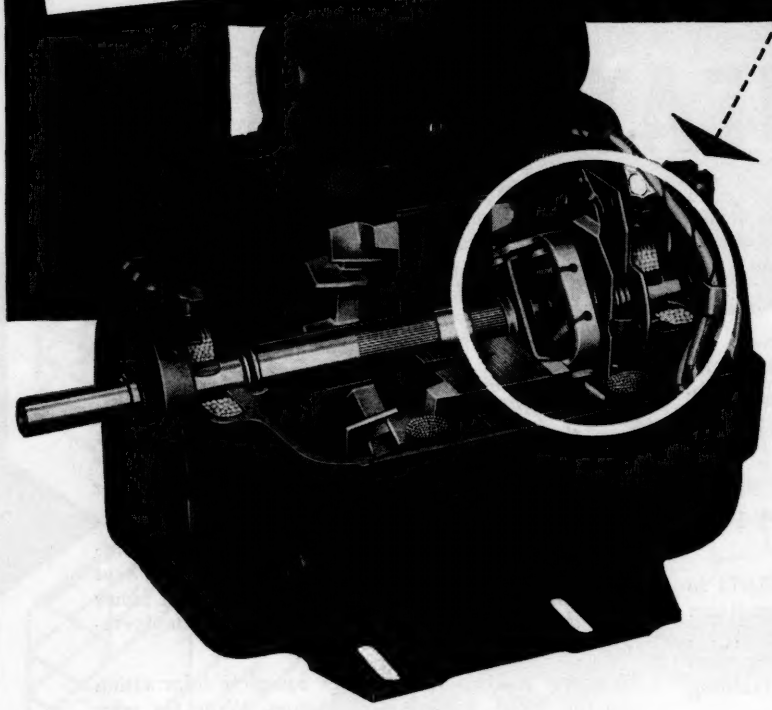
WEST VIRGINIA
Mineral Industries Bldg., of W. Va. Univ., Morgantown

WISCONSIN
Univ. of Wisc., Adams Hall, Madison
Lawrence College, Appleton
Schuster Stores, Milwaukee

"Controlled [illegible] weather"

Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

Here's the switch

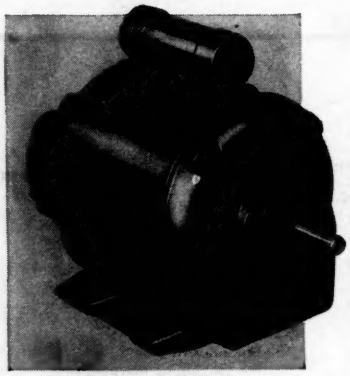


that made 3,000,000 starts and stops

Wagner Type RK capacitor-start induction motors are equipped with a Wagner-made centrifugal switch that disconnects the starting winding and capacitor from the line when the motor approaches operating speed. One of these switches, from a ⅓ hp motor, made over three million starts and stops under test—more than the motor in service would make in 85 years if it started every fifteen minutes, day and night!

In most cases, the useful life of a capacitor-start motor is determined by the life of the switch. The long life of the Wagner switch is only one of many features that make Wagner Type RK Motors the *right* choice to power your product with assurance of long, troublefree operation.

AND HERE'S THE MOTOR that fits your needs for applications requiring high starting torque



Wagner Type RK Motor
⅛ through 3 h. p.

Wagner capacitor-start induction motors are your best choice for applications where starting loads are fairly heavy, but which can be brought up to operating speed quickly. They have become increasingly popular for installation on equipment such as mechanical refrigerators, air conditioning equipment, domestic water pumps, motor-driven tools, coal stokers, and on similar fractional horsepower applications.

These motors offer low maintenance cost—only a minimum of servicing is required—and they give many years of reliable service with unusual freedom from vibration and noise.

* * *

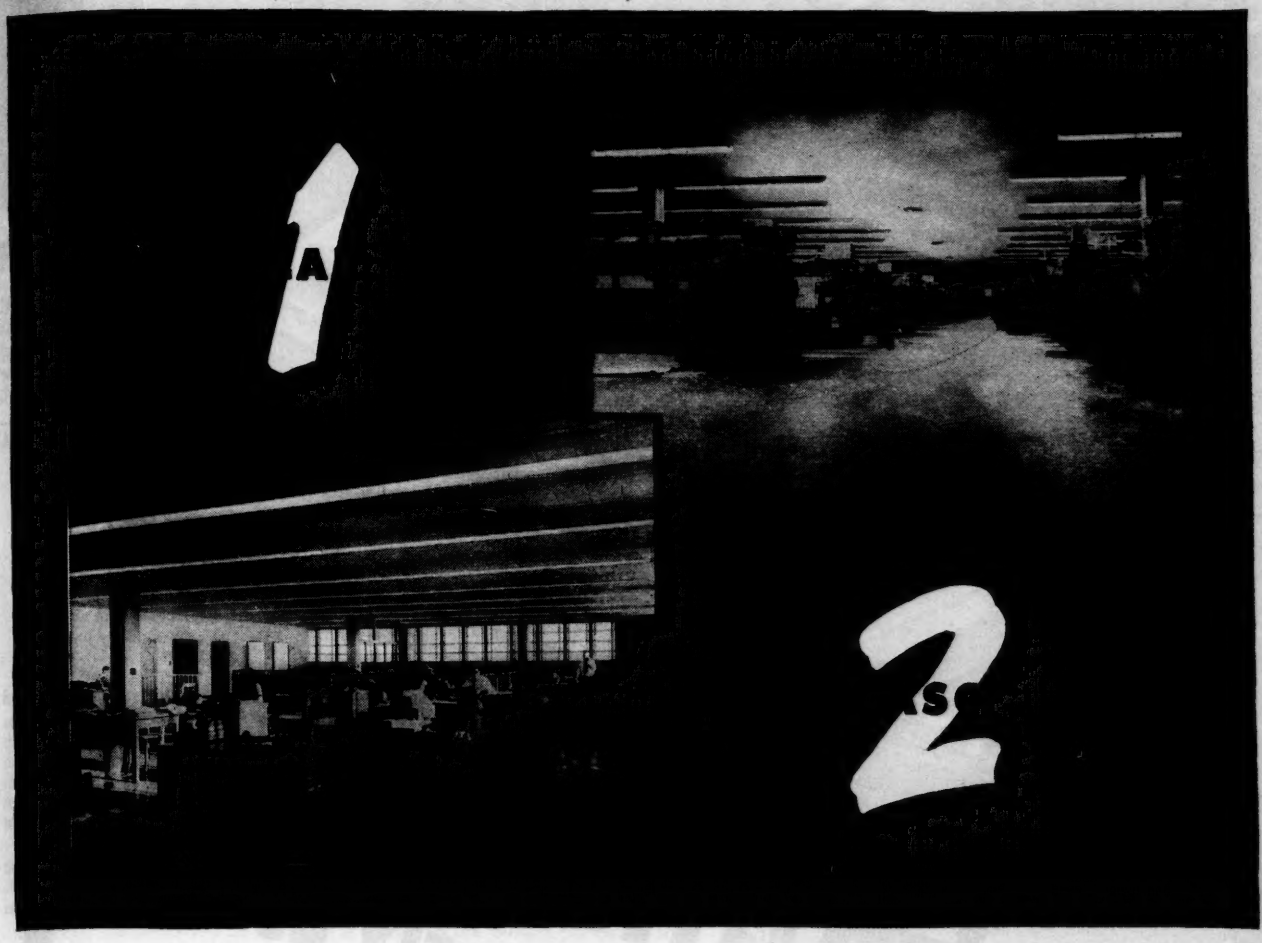
When you standardize on Wagner Motors you get the advantages of a liberal warranty . . . of nationwide service facilities, with replacement motors and parts available from more than 650 Authorized Service Stations plus 25 Wagner-owned Service Branches. You can choose from a wide variety of types and sizes (from 1/125 to 400 hp). Bulletin MU-185 gives complete information—write for your copy.

Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION
6463 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES



for choosing **kno·draft** adjustable air diffusers

Office space and manufacturing areas in this new asbestos dryer felt plant posed separate problems in air conditioning. In the manufacturing section, the vital factor in diffusion was the *even distribution* of the thoroughly conditioned air. Kno-Draft *Adjustable* Air Diffusers got the call because of their demonstrated efficiency in similar critical installations.

In offices and other employee quarters, beauty as well as efficiency had to be considered. Here again, Kno-Draft *Adjustable* Air Diffusers were selected. In addition to their unobtrusive harmony with any surroundings—from severely plain work areas to paneled directors' rooms — they assure the comfort of *draftless* air distribution.

Another big reason for choosing Kno-Draft *Adjustable* Air Diffusers for every job is their adjustability *after* installation. This means exactly the right balance of temperature and air distribution throughout the area for user comfort . . . and saves engineer and installer a vast amount of preliminary figuring. There are types and sizes of Kno-Draft *Adjustable* Air Diffusers to meet all requirements.

NEW EDITION! KNO-DRAFT DATA BOOK now in new 32-page format. Complete up-to-the-minute engineering and installation data on Kno-Draft *Adjustable* Air Diffusers. Bring your files up to date. Mail coupon today.

TRADE MARK "KNO-DRAFT" REG. U. S. PAT. OFF.

W.B. CONNOR ENGINEERING CORP.
Danbury, Connecticut
Air Diffusion • Air Purification • Air Recovery
In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. J-22, Danbury, Connecticut

Please send me the *new edition* of the Kno-Draft Data Book—without obligation, of course.

Name.....

Position.....

Company.....

Street.....

City..... **Zone**..... **State**.....

AGITAIR®

WORLD'S MOST WIDELY USED SQUARE & RECTANGULAR AIR DIFFUSERS

. . . and no wonder. AGITAIR Type R is the only diffuser to assure 100% air distribution in any shape area . . . from any location . . . without blank-offs or oversized outlets. Tailor-made for each application.

Write for Complete Data

Air Devices Inc.

17 East 42nd St. • New York 17, N. Y.

Air Diffusers • Air and Grease Filters • Exhausters

For hot water tanks and heaters

Here is our answer to the call for a thoroughly dependable, highly accurate temperature limiting valve having real discharge capacity to guard against the hazards of scalding high temperature domestic water. The new McDonnell No. 201 Temperature Relief Valve is designed to open at precisely 188°F and reach maximum capacity at 208°F. It is for a maximum operating Pressure of 125 lbs. and is A.G.A. tested, rated and listed for a heat input of 1,200,000 Btu/hr.

The No. 201 has 1,200,000 Btu/hr capacity at A.G.A. minimum test water pressure of 30 lbs. It should be kept in mind that this rating is based on water discharge because the successful operation of any temperature relief valve assumes adequate cool water replacement. If for any reason the water supply fails, temperature and pressure can continue to climb in spite of the temperature relief valve. Therefore, a proper regard for safety suggests the addition of an ASME pressure relief valve, rated in terms of steam discharge capacity, like the McDonnell No. 33 Series Btu-rated safety relief valves.

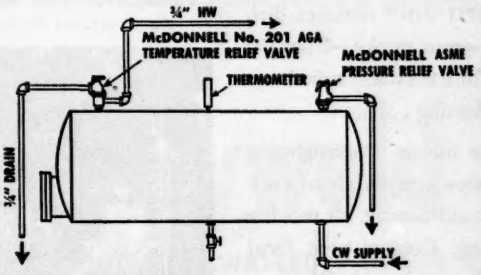
Extreme accuracy. For positive and precise valve operation, the No. 201 utilizes a newly developed adaptation of the well-known Vernatherm thermostatic element. Exhaustive laboratory and field tests have shown that when the temperature of the water surrounding this thermostatic element reaches 188° F this valve *will* open and discharge its maximum capacity at 208°F. It reseats quickly at just a few degrees below opening temperature; valve closes drip tight at 183°F.

Excessive temperature does not damage this element or vary its calibration; changes in barometric pressure do not effect its operation. In basic conception and ingenuity of design the No. 201 achieves a marked advance in temperature relief practice.

A further contribution to accuracy is found in the design provision for locating the No. 201 right in the flow of hot water to the fixtures. Note in the installation diagram that the No. 201 has, in addition to the tank and drain tappings, a tapping for the hot water supply line. As a result, service water can be arranged to flow directly through the valve and around the thermostatic element, assuring more accurate and rapid response to temperature. Utilization of the built-in fixture connection provides an automatic arrangement for eliminating any air accumulation around the temperature element, thus permitting the valve to open at the set calibrated temperature.

Thoroughly dependable. The simple, rugged, quality construction assures dependable service. Free flowing waterways through the valve provide generous clearances to prevent clogging. The Vernatherm element is hermetically sealed and exerts a powerful opening and closing force.

Complying with A.G.A. requirements, all parts of valve which are actually in contact with water are non-ferrous materials. Body is heavy brass casting. A distinguishing feature is the pull-down testing lever which provides a convenient means of testing or flushing out the valve.



A new bulletin tells the whole story of the McDonnell No. 201

McDONNELL & MILLER, Inc., 3500 N. Spaulding Ave., Chicago 18, Illinois

Doing One Thing Well

Temperature Relief Valve
Automatic Reseating
A.G.A. Tested, Rated and Listed
Heat Input 1,200,000 Btu hr.
Maximum pressure, 125 lbs.
Temperature element
188 -208 F.
All Tappings, 3 4"

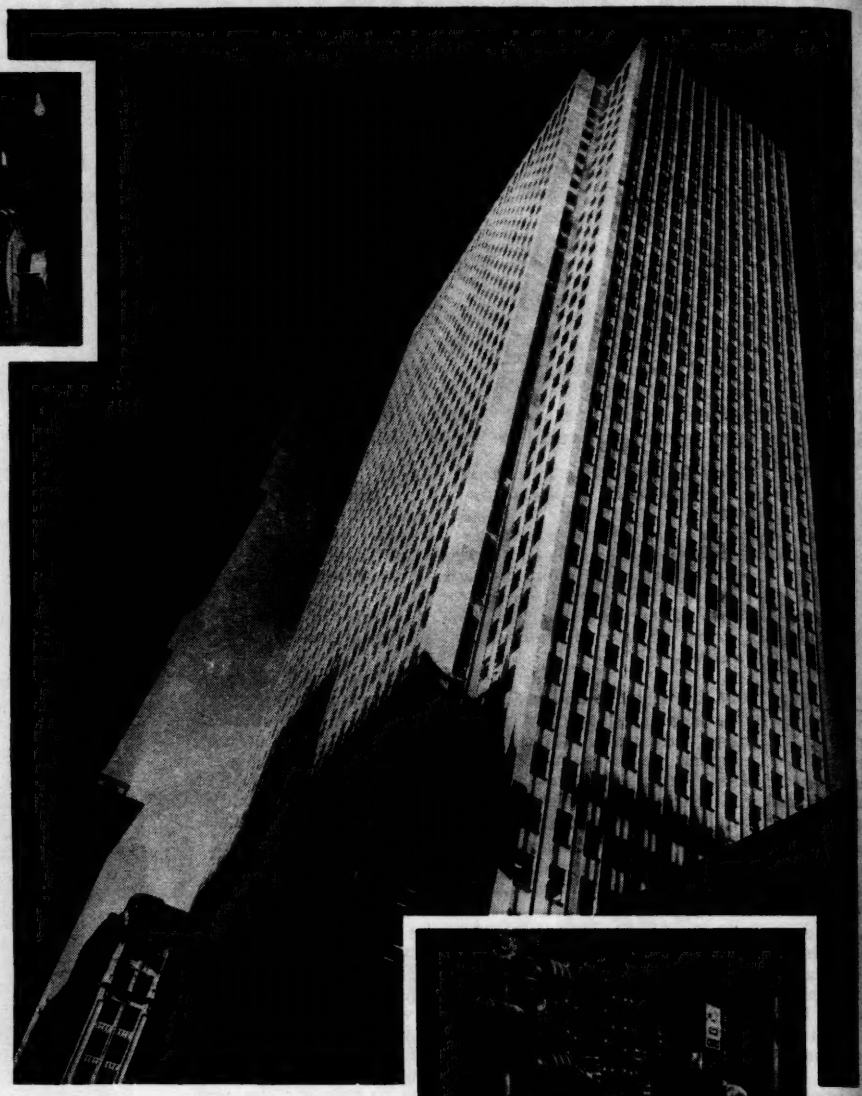
ACTUAL SIZE

INTERIOR VIEW OF McDONNELL No. 201 TEMPERATURE RELIEF VALVE.

Boiler Safety Devices

Architects: Harrison & Abramovitz, N. Y.; Consulting Engineers: Meyer, Strong & Jones, N. Y.

Seventy-nine Sturtevant fans circulate half a million cubic feet of air a minute the year 'round, quietly, smoothly.



FRESH CLEAN AIR FOR A SKYSCRAPER

It takes plenty of air to make an ultra-modern skyscraper the efficient workplace it was designed to be. For example, look at Pittsburgh's new 525 William Penn Place Corporation Building which houses the U. S. Steel Corporation and the Mellon National Bank & Trust Co. Air is the medium which keeps this building warm in winter, cool in summer—comfortable and healthy all the year 'round.

Dependable Sturtevant fans and dehumidifiers were specified for use with the heating, ventilating and air conditioning system of this massive structure. In a portion of the building, electronic air cleaning by the Westinghouse PRECIPITRON® removes dirt, soot, pollen—even smoke—from the air, will pay for itself many times over in reduced cleaning costs.

The complete line of Westinghouse equipment helps you *put air to work* . . . with air conditioning, air moving or air cleaning. Contact your local Sturtevant office, or write to Westinghouse Electric Corp., Sturtevant Division, Hyde Park, Boston 36, Mass.

Air isn't just cleaned, it's electronically-purified. 8 Westinghouse PRECIPITRON units slash cleaning costs.

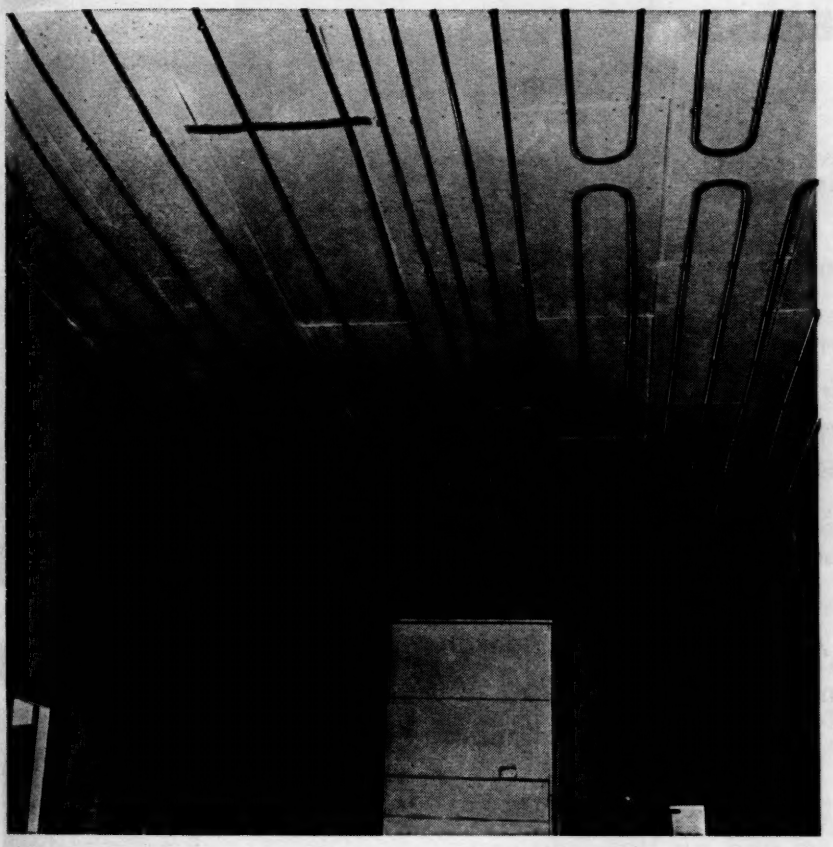
19 Sturtevant Dehumidifiers wring 660 gallons of water per hour from the air on muggy days, humidify on dry days.

YOU CAN BE SURE...IF IT'S **Westinghouse**

J-80245

Better radiant heating systems, measurable savings with Bundyweld Tubing

You want better radiant heating systems. You want them at every saving in fabrication cost and installation time you can possibly get. Then choose Bundyweld Tubing and realize both goals. See for yourself:



It is the conviction of Bundy Tubing Company that radiant heating grids rightly belong in ceilings. Among other advantages, *ceiling* installations provide proper floor warmth without danger of discomfort, respond far more quickly to thermostat demand, give a far *higher* percentage of radiant heat.

Performance: Bundyweld is leakproof. It has great bursting strength. It conducts heat quickly. Bundyweld is scale-free and clean, with uniform I.D. and O.D. for trouble-free, even water flow.

Fabrication and Installation: Standard 20′ lengths of Bundyweld (one end expanded when specified) are trucked and handled easily, yet minimize number of joints in completed systems. Ductile Bundyweld bends easily to short radii without danger of structural collapse. Two or more formed, lightweight grids can be quickly joined, easily positioned. No crushing, denting, sagging; no scrapped tubing.

Construction: Bundyweld is the *only* tubing double-walled from a single strip, with inside and outside beveled edges. It's copper-brazed through 360° of wall contact, copper-coated inside and out. It can also be furnished with a lead-tin coating. For free brochure, write Radiant Heating Division, ***Bundy Tubing Company, Detroit 14, Michigan.***

Bundyweld® Tubing

DOUBLE-WALLED FROM A SINGLE STRIP

WHY BUNDYWELD IS BETTER TUBING

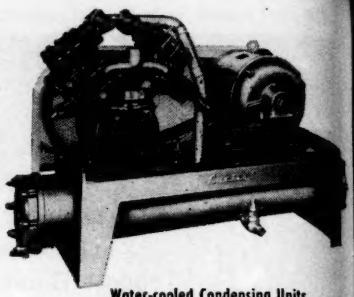
Bundyweld starts as a single strip of copper-coated steel. Then it's . . . continuously rolled twice around laterally into a tube of uniform thickness, and passed through a furnace. Copper coating fuses with steel. Result . . . Bundyweld steel tubing, double-walled, and brazed through 360° of wall contact.

← **NOTE the exclusive patented Bundyweld beveled edges, which afford a smoother joint, absence of bead and less chance for any leakage.**

Curtis

DISTRIBUTORS

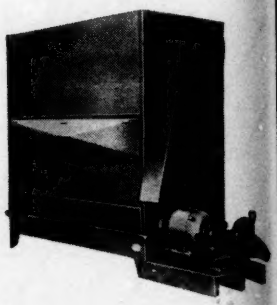
ARE MAKING MANY INSTALLATIONS IMPORTANT TO DEFENSE



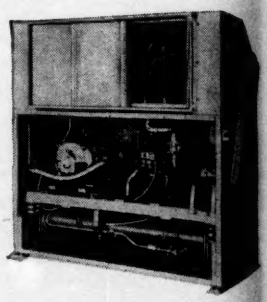
Water-cooled Condensing Units —through 40 tons

in

- **Army, Navy, Air Force Projects,**
- **Industrial Processing,**
- **Research Laboratories,**
- **Commissaries,**
- **Storage Plants— Food, Biological, Chemical**



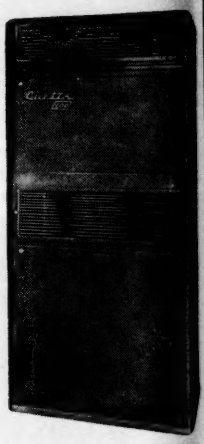
Evaporative Condensers, Cooling Towers and Air Handling Units to match



Central Type— 10-15 ton

The broad CURTIS line of Air Conditioning, Temperature and Humidity Control equipment enables CURTIS distributors to *quote* and *get* many of these installations.

With Condensing Units through 40 HP . . . Evaporative Condensers . . . Cooling Towers and Air Handling Units to match, CURTIS distributors can handle *more jobs*, make *greater profits*.



Package Type— 2-4-6-8 ton

Some Franchises are Open. Pin this coupon to letterhead and mail for complete information

Curtis REFRIGERATION AIR CONDITIONING COMMERCIAL

Curtis Refrigerating Machine Division
of Curtis Manufacturing Company
1999 Kienlen Avenue • St. Louis 20, Missouri

I am interested in a Direct Curtis Factory Franchise. Send complete details.

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Street_____

City_____ Zone____ State_____

R51-8

98 Years of Successful Manufacturing Experience is "Built-In" Curtis Equipment

Whatever the job you're right with a **DELCO!**

Whether you need totally enclosed or open-end motors . . . fan cooled or explosion-resistant motors . . . you're certain to get the right motors on the job when you choose Delco.

Each and every Delco motor is designed and built for the job it has to do. It's *made* of the finest materials, and *engineered* to stand up longer under the roughest conditions.

So check up on Delco motors, now. You'll find Delco has the motors you need, and that Delco always meets its commitments. For full details, write to Delco Products, Dayton, Ohio, or call the nearest sales office listed below.

DELCO FEATURES MAKE DELCO FINEST

DELCO
DAYTON OHIO

DELCO PRODUCTS

Division of General Motors Corporation
Dayton, Ohio

Our dealers are doing business in a big way

WE'LL TELL YOU WHY...

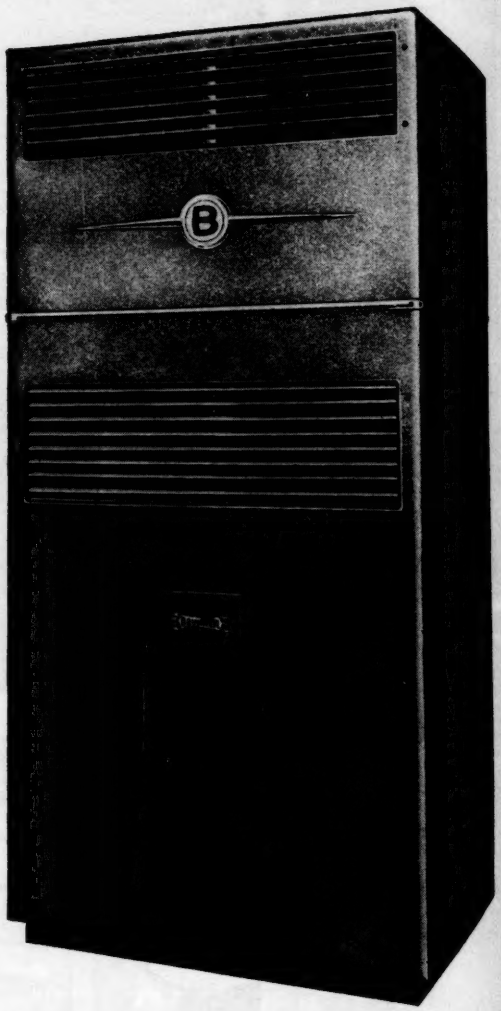
BRUNNER SINCE 1906 AIR CONDITIONING

First of all Brunner Air Conditioning Units, both self contained and remote, are Brunner built. We have absolute control over every point and every design feature that contributes to their maximum efficiency.

Buyers know what they want. Air conditioning is no longer new and in a highly competitive field prospects will choose carefully. Brunner units are built for long, dependable, carefree operation and these qualities are instantly recognized in comparison.

Brunner has customer acceptance. This name is no stranger to folks who buy refrigeration and air conditioning.

In addition Brunner dealers can offer their customers the new, exclusive Brunner 5 Year Protection Policy on all "open type" compressors from ¼ hp. to and including 10 hp. capacities.



THERE'S MUCH MORE TO BE TOLD so fill in below and our factory sales engineer will stop by with all the facts of why you could well be sharing in this profitable business. We'll send 1952 literature along at once.

CUT OUT AND MAIL

Name _____

Company _____

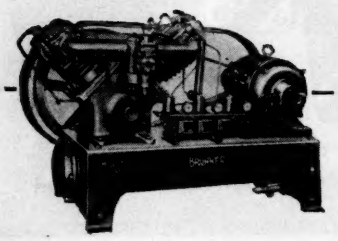
Address _____

City and State _____

BRUNNER SINCE 1906

AIR CONDITIONING

- **Self Contained 3 HP. to 10 HP.**
- **Remote Type 3 HP. to 75 HP.**



BRUNNER MANUFACTURING CO., Utica 1, New York, U. S. A.

REFRIGERATION CONDENSING UNITS by
AIR AND WATER COOLED MODELS— *a size and type for every purpose...* **¼ HP. TO 75 HP.**

BRUNNER SINCE 1906

Would you turn your back on a 4-for-1 saving?

MORE THAN 10,000 DOREX USERS are glad they didn't. They're the economy-wise buyers who, over the past twenty years, have made Dorex Air Recovery part of their air conditioning installations.

You see, Dorex Air Recovery "manufactures" *fresh* air by passing *used* air through the famous Dorex C Cell, with beds of specially activated carbon that remove all odorous and gaseous impurities. This means *only about one-third* as much new air need be taken into the system. Substantially less heating and cooling equipment is needed; operating costs are much lower.

Specifically, users' experience has shown that every $100 invested in Dorex Air Recovery should return a saving of $400 on initial air conditioning expense; and, over the years, every $1 spent for Dorex maintenance should produce a $4 saving in operating costs.

Find out how much this four-for-one return can add up to in your plant. Write us for full information.

® DOREX TRADE MARK "DOREX" REG. U. S. PAT. OFF.
Air Recovery

W.B. CONNOR ENGINEERING CORP.
Danbury, Connecticut
AIR diffusion • purification • recovery
In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. B-22, Danbury, Connecticut

Please send me, without obligation, full information on Dorex Air Recovery.

Name_____

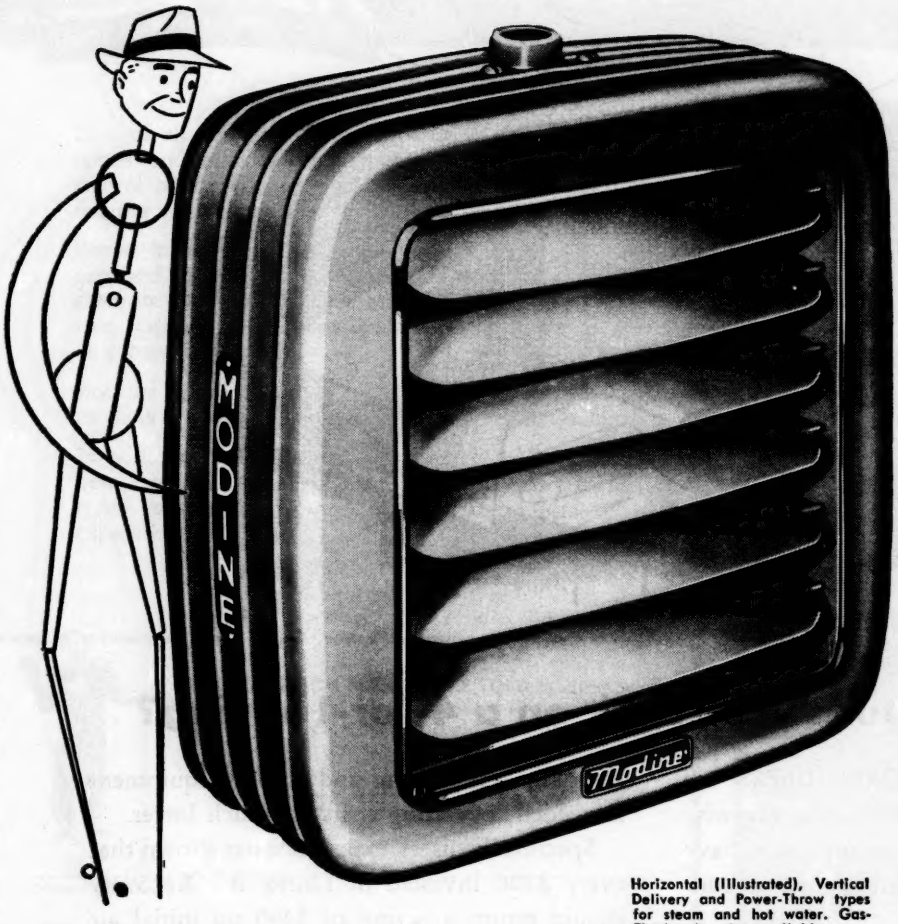
Position_____

Company_____

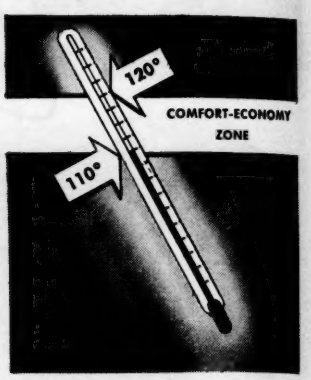
Street_____

City_____ Zone____ State_____

COMPARE...



Horizontal (Illustrated), Vertical Delivery and Power-Throw types for steam and hot water. Gas-Fired units also available.



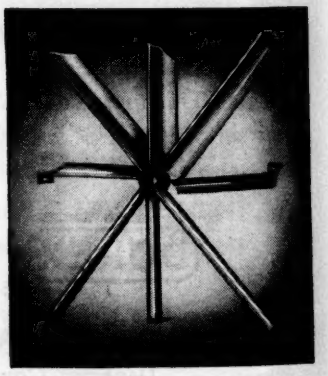
Discharge air temperatures of 110° -120° F are correctly related to air velocities—assure perfect heating comfort, lower fuel costs.

Direct-from-pipe suspension is safe and economical, with no hanger-rods. Heated air stream may be easily redirected over full 360°.

for comfort and economy Modine Unit Heaters top the field

Yes, on every count, Modine Unit Heaters stand out. For balanced heating performance . . . for high fuel economy . . . for long years of trouble-free service—Modine is first choice of experienced heating men. *Compare* —you'll choose Modine every time. Modine Mfg. Co., 1511 DeKoven Ave., Racine, Wis.

Write for Bulletin 149-A, "Modine Unit Heating." Or contact your Modine representative listed in your classified phone book.



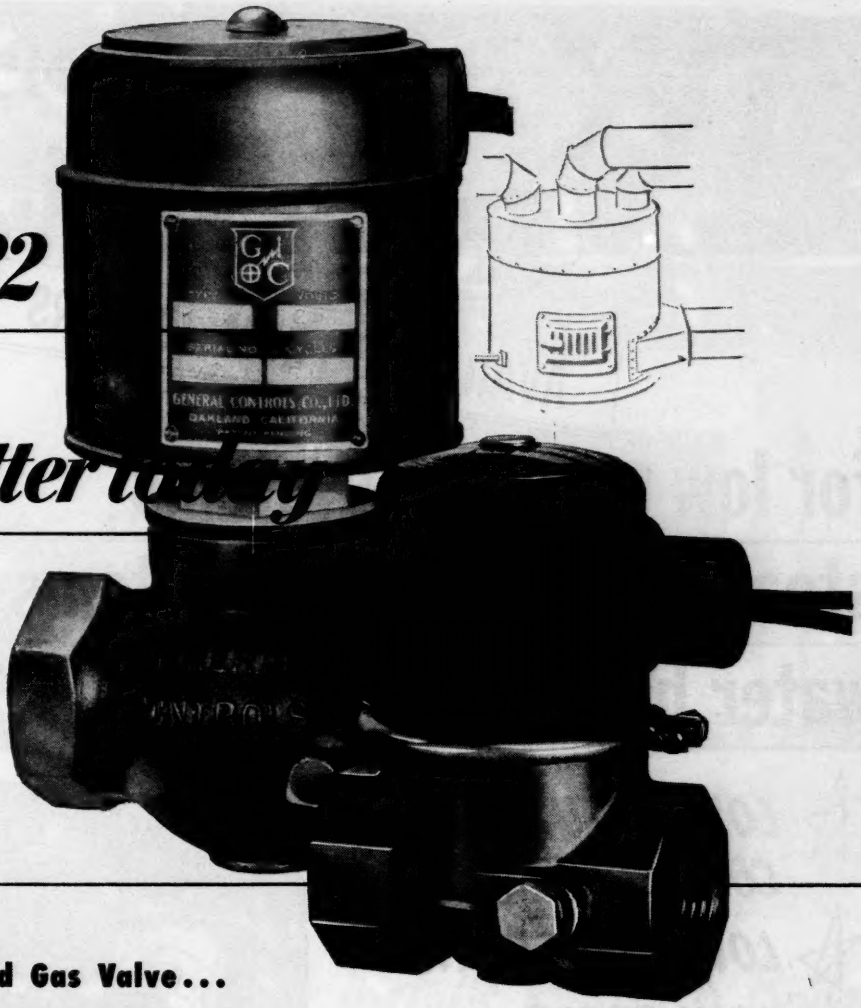
Built-in velocity generator effectively steps up heat throw. This assures positive heat penetration of cold air strata near the floor.

Modine UNIT HEATERS

U-1133

new in '32

still better today

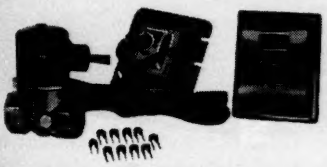


Improved K3-A Solenoid Gas Valve...

Quiet—Dependable—Hi-Capacity—

Soft Seat—For All Gases—

Way back in 1932, the forebear of the present K3-A was originated, developed and pioneered by General Controls. It became the first in a long series of quiet, dependable, two-wire solenoid magnetic gas valves that today are standard equipment at home and in industry for controlling gas to warm air furnaces, gas-fired boilers, conversion burners and similar applications. Closing with the gas flow, in the K3-A the pressure is on the top of the soft seat assuring indefinitely tight valve shut-off. Closing is automatic in case of power failure, and the K3-A, like all other General Controls solenoids, is absolutely humless when energized. Current consumption is low and the extremely compact valve easily meets high flow capacities and operating pressure requirements. In the K3-A you find just one more sound reason why the leaders everywhere declare that for the best in *automatic* controls, it's General Controls!



T-30 PACKAGE SET

For automatic heat at home, the General Controls T-30 Package Set is a sure short cut to economical and trouble-free comfort. Included with the graceful T-70 Timer Thermostat, is the long-proved, Type K3 Magnetic Gas Valve, Transformer and Thermostat Cable. Optional Timer Thermostat is furnished in two models, either for internal night setting (T-70-T) or with both day and night temperature selection at your finger tip (T-70-X) on the face of the sleek and satin-finished cover.

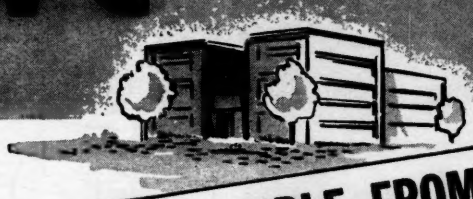
GENERAL CONTROLS

801 ALLEN AVENUE GLENDALE 1, CALIFORNIA

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls

FACTORY BRANCHES: Baltimore 5, Birmingham 3, Boston 16, Buffalo 3, Chicago 5, Cleveland 15, Columbus 15, Dallas 2, Denver 4, Detroit 21, El Paso, Glendale 1, Houston 6, Indianapolis 4, Kansas City 2, Milwaukee 3, Minneapolis 2, Newark 6, New Orleans, New York 17, Omaha 2, Philadelphia 23, Pittsburgh 22, St. Louis 3, San Francisco 7, Seattle 1, Tulsa 6, Washington 6, D.C.
DISTRIBUTORS IN PRINCIPAL CITIES

TVC CONDENSATION weil PUMPS



AVAILABLE FROM JOBBERS STOCK

for low pressure systems
steam mains-heating systems
water heater coils

- *LOW RETURN CONNECTIONS*
- *LOW WATER LINE*
- *LOW SPEED LONGER LIFE*
- *CAST IRON RECEIVER single or duplex*

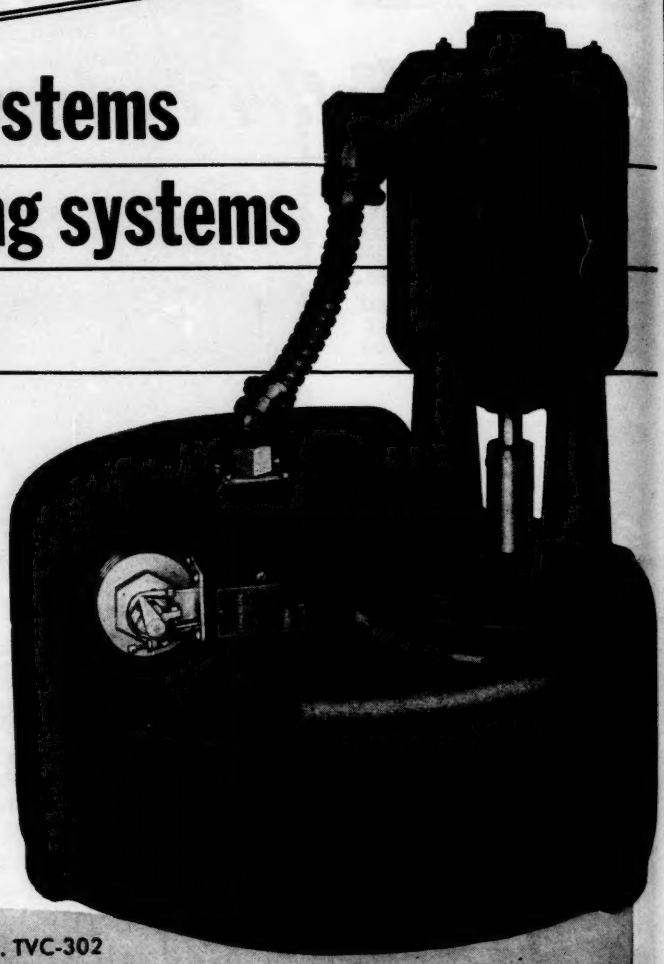


Fig. TVC-302

*TVC low return connection simplifies layout

- Permits overhead lines
- Eliminates underground lines
- Capacities 500 to 10,000 sq. ft. E.D.R.
- All Bronze Pump Head

*NRG underground condensation pumps

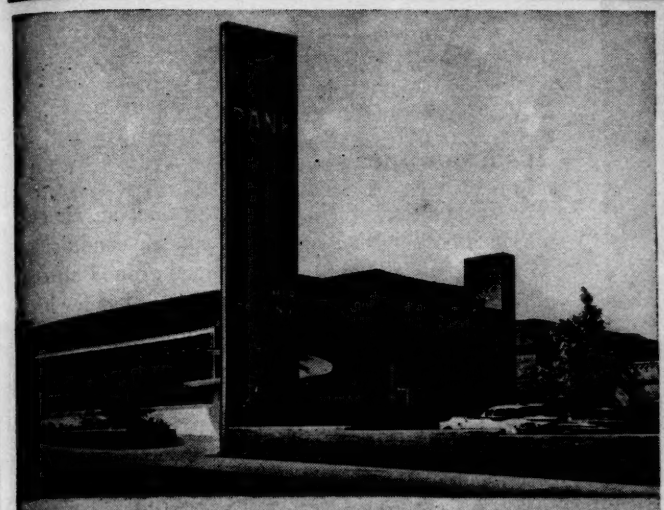
- Cast Iron Receiver
- Low Return Connections
- Installed in the ground
- Requires limited space

*WRITE FOR BULLETINS TVC-300 and NRG 200-B

weil PUMP COMPANY 1523 N. Fremont St. Chicago 22, Illinois

AMERICAN-Standard

First in heating...first in plumbing



Sixth and Denny Branch of Seattle-First National Bank. Architect: John W. Maloney, A.I.A.; Mechanical Engineer: DeWitt C. Griffin & Associates; Mechanical Contractor: Eastman Plumbing & Heating Co.; General Contractor: General Construction Co. All are Seattle firms.

A battery of two or more Redflash Boilers provides a heating plant of extreme flexibility. In cold weather the entire battery will team up to take care of the load. On mild days the fluctuating demand for heat can be efficiently handled by one of the boilers, thus effecting desirable economies in fuel.

Seattle's Most Modern Bank installs Redflash Boilers

Newest branch is fifth in large state-wide system to be heated by AMERICAN-Standard equipment

● One of the nation's fastest growing banks is the Seattle-First National. And it is one of the most progressive. Operating a state-wide system of branch offices, this great institution now ranks 24th in deposits among all banks of the country.

The attractive building shown above is the fiftieth and newest branch to be opened. Known as the Sixth and Denny Branch and located in the heart of Seattle's northern downtown business district, this modern banking building incorporates many unique banking facilities, including drive-in banking and a large parking area.

Another feature which reflects this important bank's sincere interest in the health and comfort of its customers . . . and its own personnel, is the installation of two American-Standard Redflash Boilers to insure dependable and efficient heat and operating economy. Redflash Boilers have also been installed in four other recently opened branches.

Redflash boilers provide economical heating for your commercial jobs!

Expertly engineered and sturdily constructed, the Redflash Boiler can be installed singly or in battery to provide an abundance of heat for large residences or commercial buildings of practically any size. Its scientifically proportioned combustion chamber, direct heating surface, and long flue travel for hot gases assure highest heat output with the least fuel. The Redflash Boiler and other large size oil fired heating units in the American-Standard line are sold through selected wholesale distributors to heating and plumbing contractors.

Easy to Install...

Redflash Boilers are shipped in sections, so that even the largest size is easily moved through a door or elevator hatch. Can be assembled quickly without tearing down walls or shifting heavy equipment.

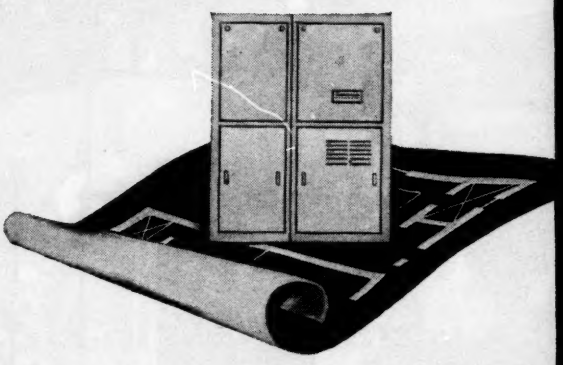
American Radiator & Standard Sanitary Corporation, P. O. Box 1226, Pittsburgh 30, Pa.

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · CHURCH SEATS · DETROIT LUBRICATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

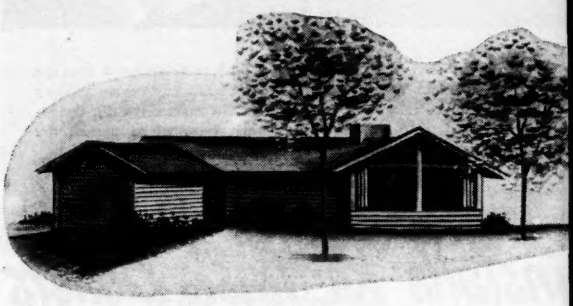
Would you like to sell an idea?

The product is the Carrier Weathermaker Air Conditioner. The idea is the Carrier Weathermaker Home . . . a new kind of home . . . built around air conditioning.



It's a new idea

The Weathermaker Home is more than an air conditioned house. It's a house that puts air conditioning to work! It's a house that's designed around air conditioning. So that the air conditioning pays for itself out of savings. A more compact floor plan. No screens or storm sash. No attic fans or ventilating louvers.



It's a cinch to sell

Who are you selling? Architects, builders, and anybody who wants a new house. How do you reach them? Well, we're talking to them in a dozen national publications and we're putting a pretty wonderful 32-page book in their hands at the drop of a postal. So we don't lack for leads. And when it comes to selling, you've got something people want.

And there are extras

And it's not all residential, because there's also a ready-made commercial market for this Carrier Weathermaker Air Conditioner that heats and cools. It's a natural for better shops and offices where they want the air conditioner tucked out of sight. To top it off, these air conditioners carry the Carrier name.

CARRIER CORPORATION
306 S. Geddes Street, Syracuse 1, N. Y.

Please send me "How to Have a Carrier Weathermaker Home."

*Name*_____

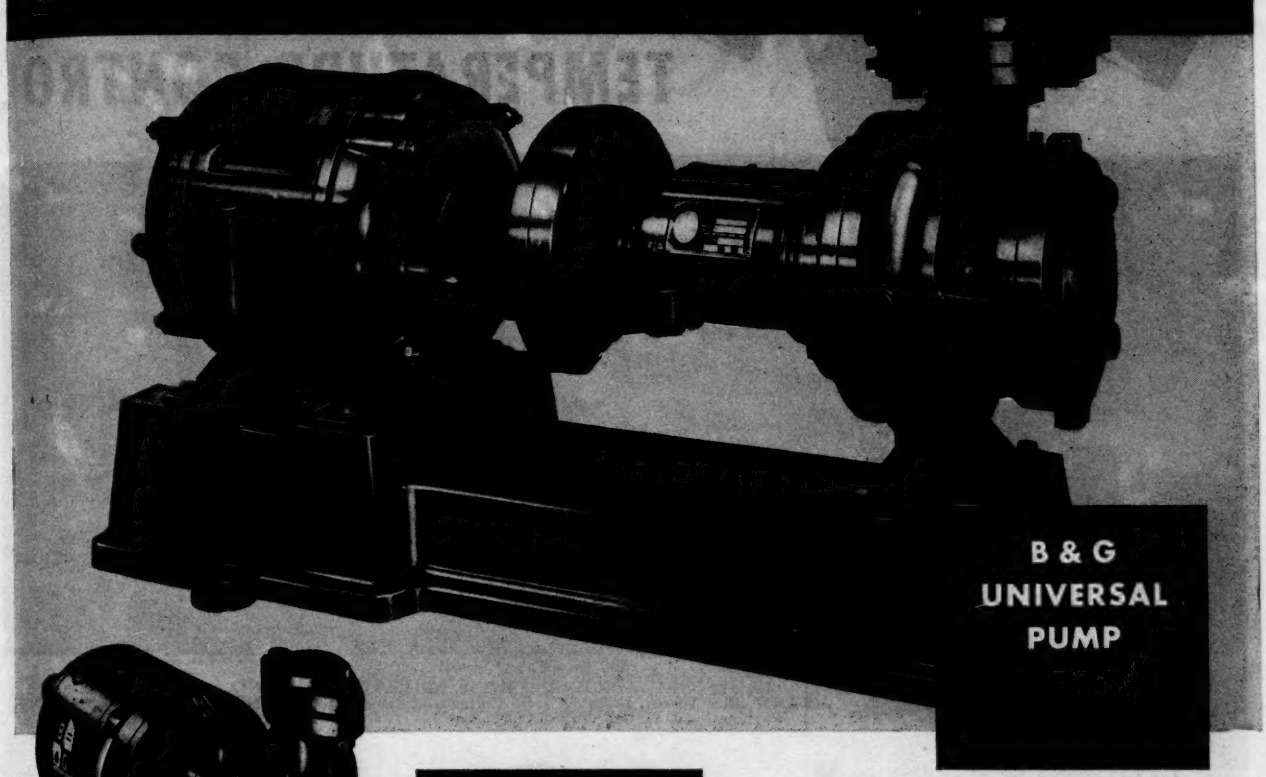
*Street*_____

*City*_____ *State*_____

Carrier

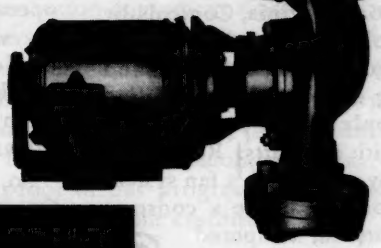
AIR CONDITIONING • REFRIGERATION

You can do a Better Job



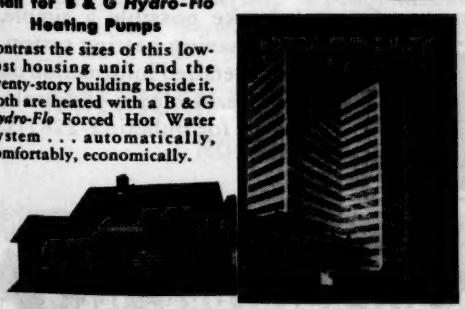
B & G
BOOSTER
PUMP

B & G TYPE
"PD" PUMP



No job too big or too small for B & G *Hydro-Flo* Heating Pumps

Contrast the sizes of this low-cost housing unit and the twenty-story building beside it. Both are heated with a B & G *Hydro-Flo* Forced Hot Water System . . . automatically, comfortably, economically.



In any B & G *Hydro-Flo* Pump you buy, regardless of size, you will find all the basic features which have made this line of pumps preferred by specifiers and installers of heating equipment.

B & G Boosters and Universals are not just ordinary centrifugal pumps. They are designed and built specifically for heating system application. That's why they are *quiet*—that's why they operate on a minimum of power. B & G Pumps have consistently proved their efficiency and dependability—thousands have been in operation for many years without need for service of any kind.

And that's why more B & G Hydro-Flo Pumps are sold than any other built for the same purpose!

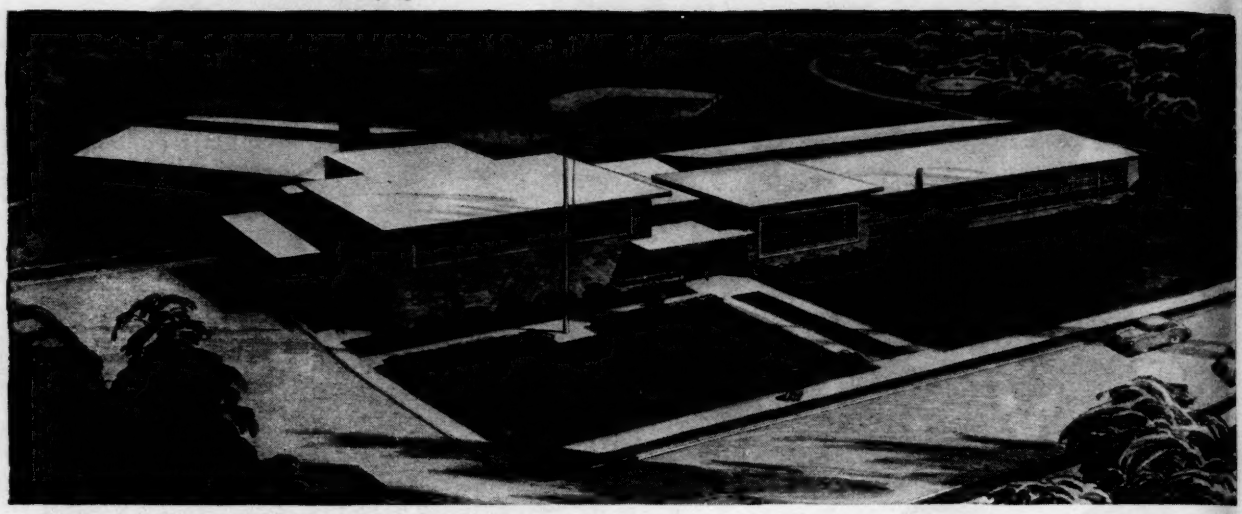
Whether you are planning the heating of a cottage, a factory or a wide-spread garden apartment, remember that B & G Pumps are available in sizes closely matched to the pumping requirement.

For full information, send for the B & G Catalog.

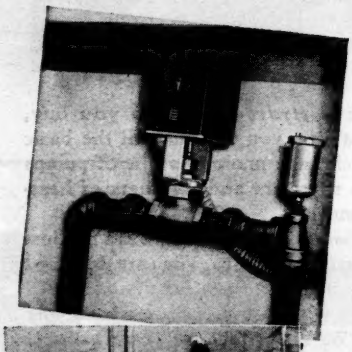
BELL & GOSSETT
COMPANY
Dept. CJ-4, Morton Grove, Ill.

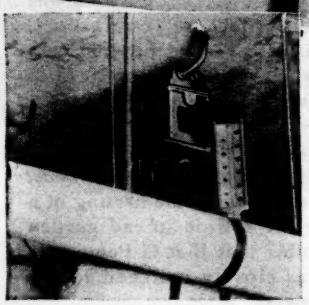
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada
*Reg. U. S. Pat. Off.

THE A B C OF PROPER *Automatic* TEMPERATURE CONTROL



OAKRIDGE SCHOOL, ARLINGTON, VIRGINIA
ARCHITECTS: Allen J. Dickey & John Graham, Jr. Arlington, Va. ENGINEER: A. Dee Counts. Washington, D.C. HEATING CONTRACTOR: W. J. Baumbach, Inc., Arlington, Va.





Above, Barber-Colman Motor-Operated Valve as installed on the hot water supply to each room.

Below, Barber-Colman Motor-Operated Valve on the steam supply to converter in the boiler room.

ALWAYS BARBER-COLMAN

THIS is *fundamental* with experienced heating and ventilating engineers: the A B C fact that Barber-Colman controls are at the top of the roll-call.

In the modern Oakridge School at Arlington, Virginia, Controls by Barber-Colman were installed to provide a good, efficient, heating and ventilating system with flexibility. Panels supply a steady, even flow of warmth with no drafts. Rooms are grouped by zones with a fan system in each zone to assure a constant flow of filtered, tempered air for ventilation and maximum comfort. Fans are shut down at night.

Water temperature, from the converter on the oil-fired steam boiler, is varied automatically by an outdoor reset thermostat. Individual room temperature is kept constant and over-runs avoided by use of anticipating thermostats and motor-operated valves. Since system supply water temperature varies with outdoor temperature, corridors are kept comfortable with minimum heat losses without use of valves and thermostats.

So, once again Barber-Colman Controls make possible a simple, cost-saving heating system. For detailed information on Barber-Colman Controls, write for Bulletin F-2287-3.

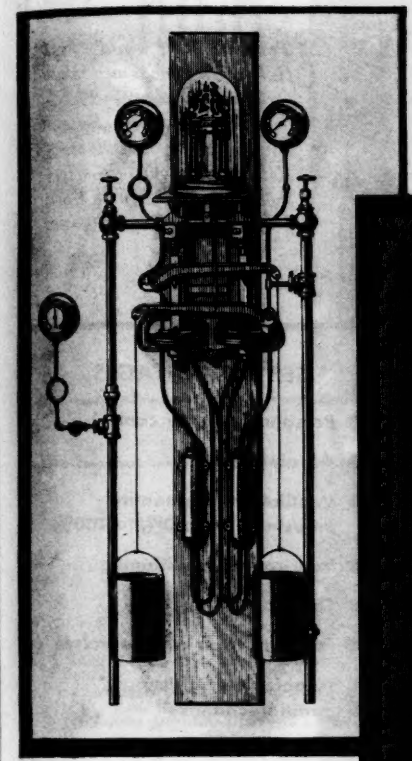
BARBER COLMAN

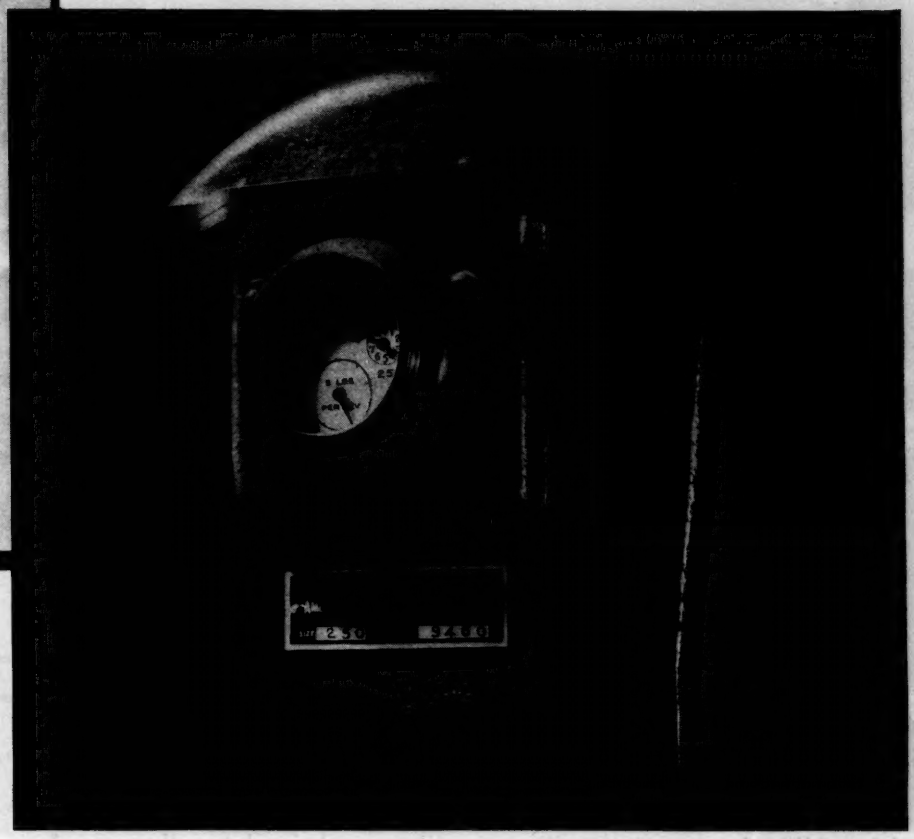
NATION-WIDE SALES AND ENGINEERING SERVICE

BARBER-COLMAN COMPANY, 1224 ROCK ST., ROCKFORD, ILL.

ADSCO HAS COME A LONG WAY IN

75 years





IN celebrating our 75th anniversary this year, we have been reflecting on the great advancement of steam distribution equipment since 1877, when the founders of ADSCO built the first district heating system. Compare, for example, the old-time flow meter shown at left and the rugged, compact condensate meter ADSCO makes today. The modern meter, with a much higher degree of accuracy, measures any clear liquid under gravity as well as steam condensate. In all our products — expansion joints, heat exchangers, pipe accessories, and meters — we have constantly striven for improvement in design and manufacture. Our present undisputed leadership is proof of our progressive organization — always keenly aware of the needs of our customers.

AMERICAN DISTRICT STEAM COMPANY, INC.
NORTH TONAWANDA, NEW YORK

ADSCO
75 YEARS OF LEADERSHIP

YORK *Unitary* AIR CONDITIONING

Tenants of the world's first fully air-conditioned skyscraper apartment — Philadelphia's 25-story Rittenhouse Claridge and 20-story Rittenhouse Savoy—select their own weather with York Unitary Air Conditioning.

USER ADVANTAGES

- Personal weather control
- All air filtered
- Ventilation air quantity adjustable from 0% to 100%
- Year-round conditioning
- Quiet operation
- Freedom from outside noises
- Adaptable to office partition changes
- Positive circulation and uniform distribution of air

Saves time in planning and designing!

Saves cost in installation and operation!

York Unitary Air Conditioning combines the advantages of both central system and packaged conditioner. The result is multi-room, multi-story air conditioning with lower first costs . . . lower operating costs . . . lower installation costs . . . and maximum user satisfaction.

York Unitary Air Conditioning heats in winter . . . cools and dehumidifies in summer . . . filters, ventilates and circulates all year 'round. The user tailors the weather to his taste . . . instead of being dependent on a fixed, centralized system.

Knotty planning, designing and installation problems are eliminated. Minimum space is required for installation, and in both rental area and engine room. Only three small pipes are needed—water supply and return, and drain. Since the only central system is water supply, air handling equipment is not required.

Consult your nearby York Representative today (he's listed in your Classified Directory) or write York Corporation, York, Pennsylvania.

OWNER ADVANTAGES

- Quick, easy and economical installation
- Economy in initial, owning and operating costs
- Only 3 pipes required —space saving
- Complete filtering of all air circulated reduces cleaning and redecorating costs
- York Unitary Air Conditioners may be installed to provide heating initially and cooling added later
- Outside air plenum simplifies ventilation air connection
- Negligible maintenance—no disturbance to tenants

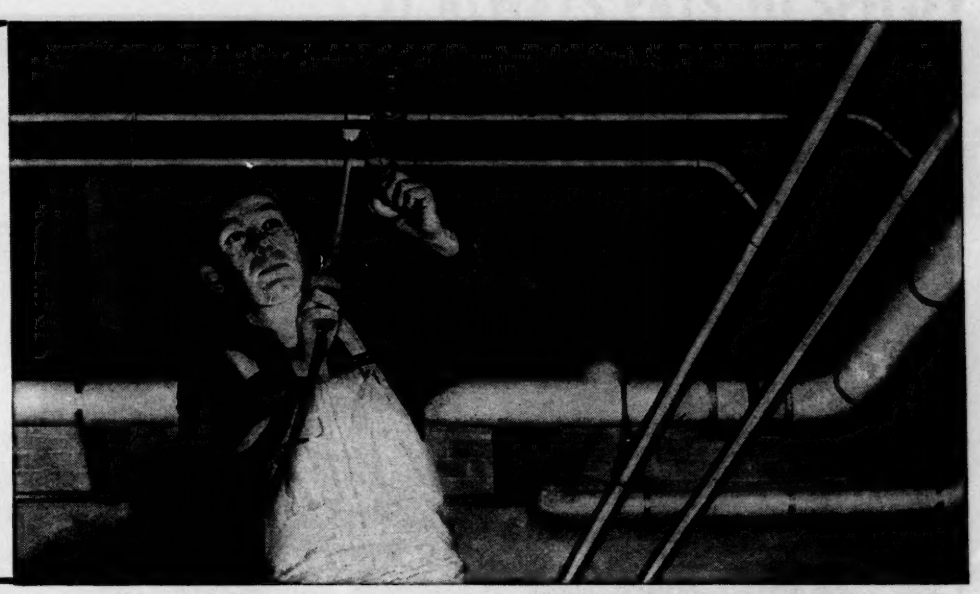
York refrigeration air conditioning

The big advances come from YORK

Headquarters for— **Refrigeration and Air Conditioning**

HIGH

For domestic hot and cold water lines you can still use copper — non-rusting, highly resistant to corrosion!



LOW

The use of copper for underground service lines—another place where you need this hardy metal—is not prohibited by government regulations!

...Chase Copper Water Tube is best!

Made from commercially pure copper, Chase Copper Water Tube is ideal for hot and cold water lines and underground piping.

Chase Copper Water Tube, Type L, hard temper, in 20 ft. lengths and solder-joint fittings are especially adapted for use in new construction. For replacing old rusted-out piping, Chase Copper Water Tube, Type K, soft temper, comes in long 40 and 60 ft. coils that can be snaked behind walls and under flooring.

For underground installations use Type K, soft temper, Chase Copper Water Tube. It is ductile; can be bent around obstructions; moves with the earth until the fill settles. Long lengths up to 100 ft. in coils reduce the number of flared fitting connections to a minimum.

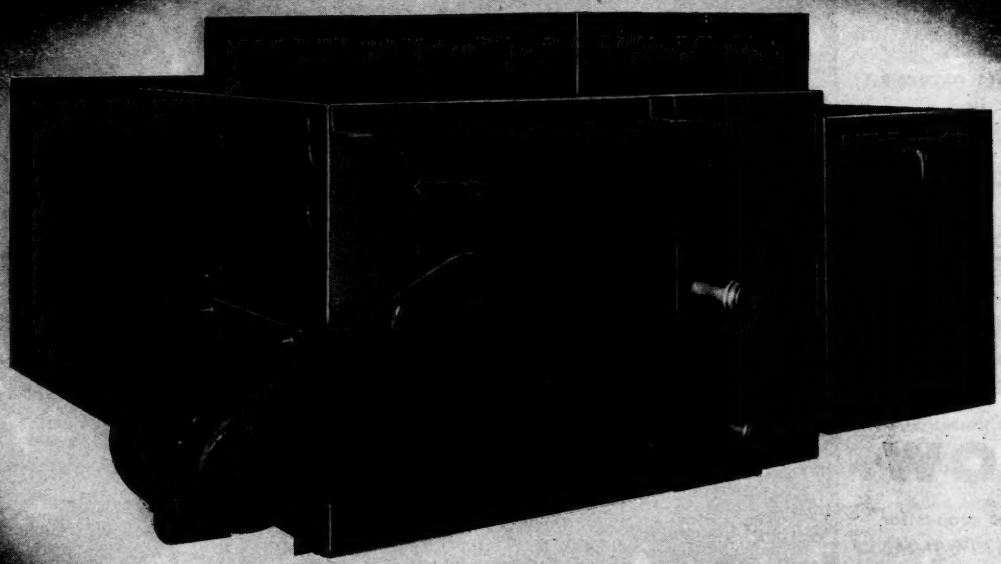
Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston†	Newark	Rochester†	(†sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

KENNARD *Engineered*



Heating and Ventilating Units

Air Volumes from 400 to 21,000 CFM

Kennard Heating and Ventilating Units are the answer to requirements of heating and filtering recirculated air, fresh air, a mixture of both, or for ventilation only. These ruggedly constructed and easily installed units, conventionally used for heating large spaces or as a central station unit to heat many small rooms, can also be utilized for a variety of special and process applications.

Wall - Floor - Ceiling Mountings

Pre-heat and Re-heat Coils - 1.1 to 32.5 sq. ft. face.

Moderate tip speeds and outlet velocities

Optional Equipment

Mixing Box and Dampers • Face and By-pass Dampers • Throwaway, Cleanable or High Velocity Filters • Target, Grid or Pan Humidifiers.

Representatives in Principal Cities

Write for name of nearest representative and complete information on Air Conditioning Blower Units—Finned Coils—Evaporative Condensers—Cooling Towers—Sprayed Coil Dehumidifiers—Multi-Zone Air Conditioning Blower Units.

KENNARD CORPORATION • 1823 S. HANLEY ROAD ST. LOUIS 17, MO., U.S.A.

IT ALWAYS PAYS TO SPECIFY

LADISH

Controlled Quality

PIPE FITTINGS

TO MARK PROGRESS

...where flow efficiency is a vital factor

You can depend on Ladish Controlled Quality Fittings to maintain maximum flow characteristics of any piping system . . . and do it consistently year after year. For advanced Ladish engineering assures the true circularity, full effective radii and smooth inner surfaces necessary to keep turbulence and friction loss at a minimum . . . features which are doubly safeguarded by the high, inflexible standards of Ladish Controlled Quality.

THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED UNDER ONE ROOF...ONE RESPONSIBILITY

LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
St. Louis • Atlanta • Houston • Tulsa • Los Angeles • Havana • Toronto • Mexico City

Famous Labels suggest the choice

Many of the big textile mills . . . names your wife will recognize . . . "air-control" many of their manufacturing operations with Worthington air conditioning and refrigeration.

And many of the famous shops where the mills' products are sold . . . Saks Fifth Avenue, The Higbee Company, J. L. Brandeis, Lane Bryant, many Sears Roebuck Stores... are air-conditioned by Worthington.

No other manufacturer makes so complete a line. A Worthington system is all Worthington-*made*—not just Worthington-assembled—assuring you of perfectly balanced operation and unit responsibility.

Worthington Pump and Machinery Corporation, Air Conditioning and Refrigeration Division, Harrison, New Jersey.

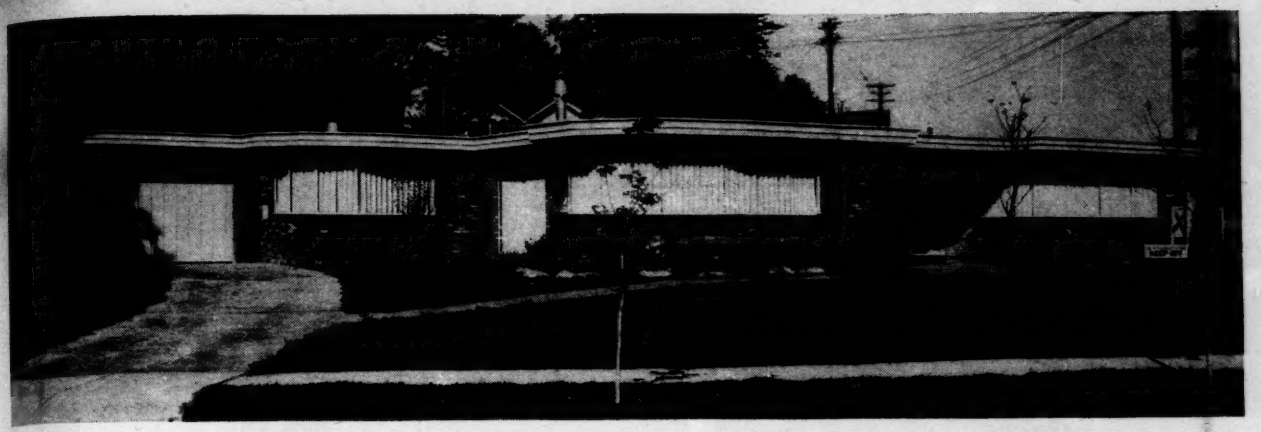
America's Leaders... in Many Businesses... Select

WORTHINGTON

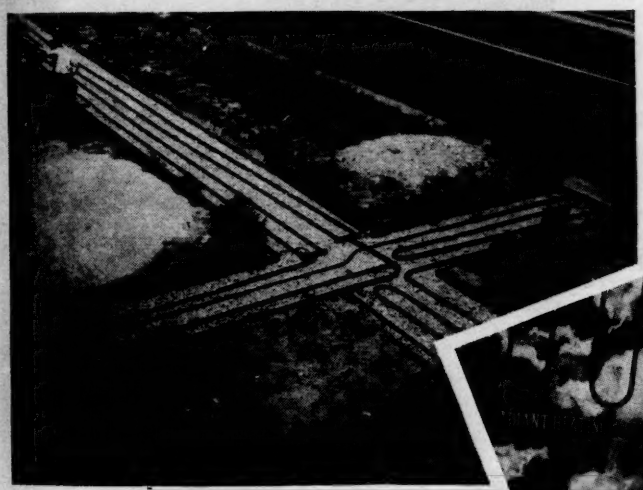
A2

AIR CONDITIONING AND REFRIGERATION

The Most Complete Line... Always the Correct Recommendation



A mile of pipe for a mile-high house!



Contains data for estimating heat losses, designing coil systems for floor *and* ceiling installations, typical coil patterns, testing procedures, fitting resistances, insulating techniques, pipe data and heat transmission tables.

● "Sun-Age Homes"* are well-known in mile-high Denver. Windows are big (over 40% of wall area). Plenty of storage space is built-in. The functional design makes for easy living. And—

Radiant heating is an important selling feature of every Sun-Age Home. Not just the interior, but the driveway and sidewalks of the house are heated with 6000 feet of NATIONAL *Steel* Pipe—the standard pipe for hot-water heating for over 60 years.

In the first 10 days that this sample home was displayed, over 8,000 adults visited it. *90%* of these people requested more information on radiant heating and snow melting. This intense public interest in the comfort and convenience of these systems has helped to sell a lot of Sun-Age Homes—just as it's helping to sell homes in every part of the country.

NATIONAL *Steel* Pipe is just the thing for an installation like this: It's economical. It's easy to weld. It's strong. Yet it's ductile enough to allow easy bending.

NATIONAL *Steel* Pipe has been widely used for radiant heating, so get the full particulars. This information is yours for the asking in our 48-page book, "Radiant Heating." Send the coupon now.

**Trade Mark, Reg.*

NATIONAL TUBE DIVISION, UNITED STATES STEEL COMPANY
PITTSBURGH, PA.

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
PACIFIC COAST DISTRIBUTORS

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

NATIONAL TUBE DIVISION
United States Steel Company
525 William Penn Place, Pittsburgh 30, Pa.

Please send your free Bulletin No. 19, "Radiant Heating."

Name .....

Company .....

Address .....

City & State .....

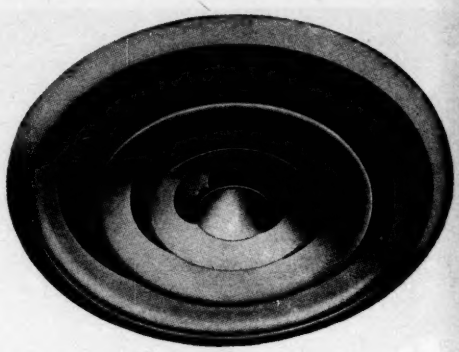
U·S·S NATIONAL Steel PIPE

USS

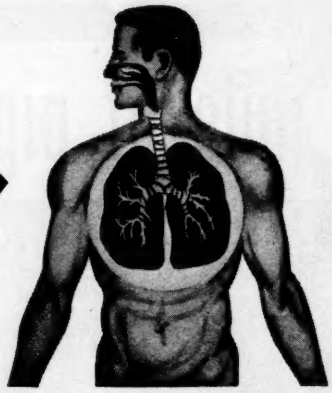
UNITED STATES STEEL

Anemostat

Air Diffusers...

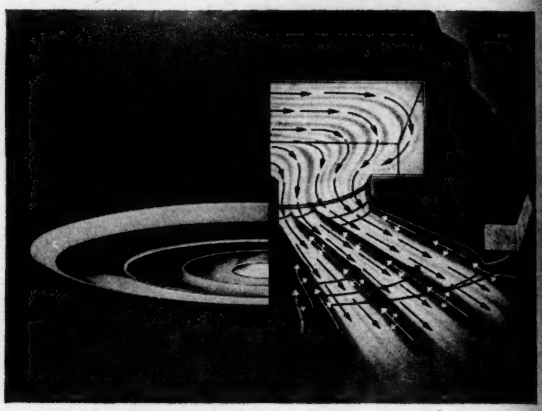


actually "breathe"...



to give you

conditioned comfort



The familiar process of breathing dramatically illustrates the Anemostat principle of aspiration. Just as we inhale air, mix it within our lungs and expel it, so Anemostat air diffusers also aspirate . . . by drawing room air *into* the unit and mixing this room air with supply air *within* the outlet before distributing the mixture in many planes traveling in *all* directions.

This aspiration effect eliminates uncomfortable drafts and stale air pockets . . . equalizes temperature and humidity throughout the conditioned area.

Yes, breathing is essential to human life . . . and to the proper performance of heating, ventilating and air conditioning systems. Remember, only Anemostat air diffusers are designed to perform this vitally important function of aspiration.

ANEMOSTAT®

DRAFTLESS *Aspirating* AIR DIFFUSERS

ANEMOSTAT CORPORATION OF AMERICA
10 EAST 39th STREET, NEW YORK 16, N. Y.
REPRESENTATIVES IN PRINCIPAL CITIES

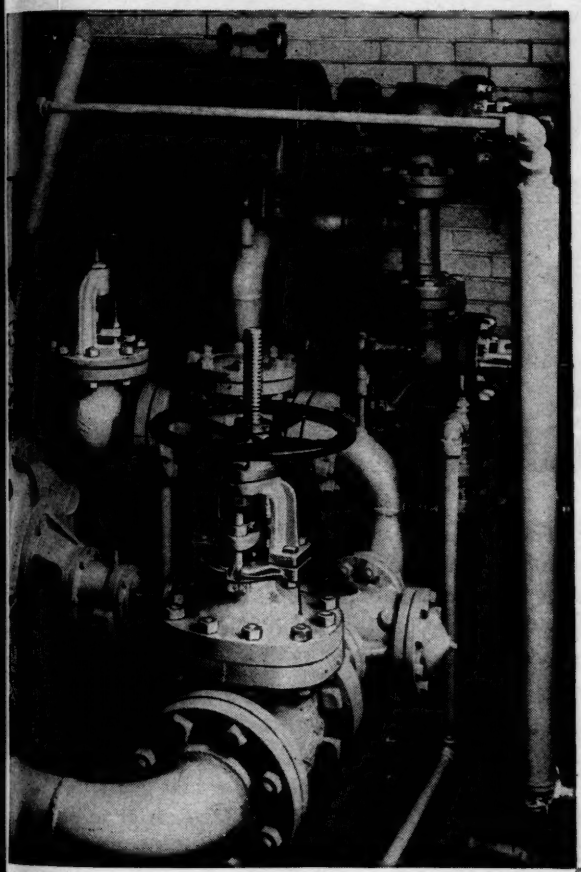
"No Air Conditioning System Is Better Than Its Air Distribution"

AC-1284

Where Power and Heat protect the helpless...

Buffalo State Hospital relies on Jenkins Valves

Architects: YORK & SAWYER, NEW YORK
General Contractor: THE JOHN W. COWPER CO., INC., BUFFALO, N. Y.
Plumbing Contractor: GEO. H. DRAKE, INC., BUFFALO, N. Y.
Heating Contractor: QUACKENBUSH CO., INC., BUFFALO, N. Y.



Among the 1100 Jenkins Valves in the new Power House at the Buffalo, N. Y., State Hospital are these in the prefabricated pump heater set. More than 875 others control steam, water, fire, air conditioning and other vital pipelines in the new Medical and Surgical Building.

Serving a veritable "city of patients", the new power plant at this New York State Institution, one of the nation's largest, provides heat and power for many separate buildings. One building alone, the newly-completed Medical and Surgical unit, has 698 rooms.

In such a complex modern "plant" for the treatment and comfort of patients, power and heat must be supplied with unfaltering *efficiency.* On their performance record, Jenkins Valves were chosen.

This same efficiency is essential to operating *economy,* present and future, in *all* buildings served by power installations. That's why Jenkins Valves have been the choice, consistently, for so many of the notable new plants and buildings arising throughout the nation.

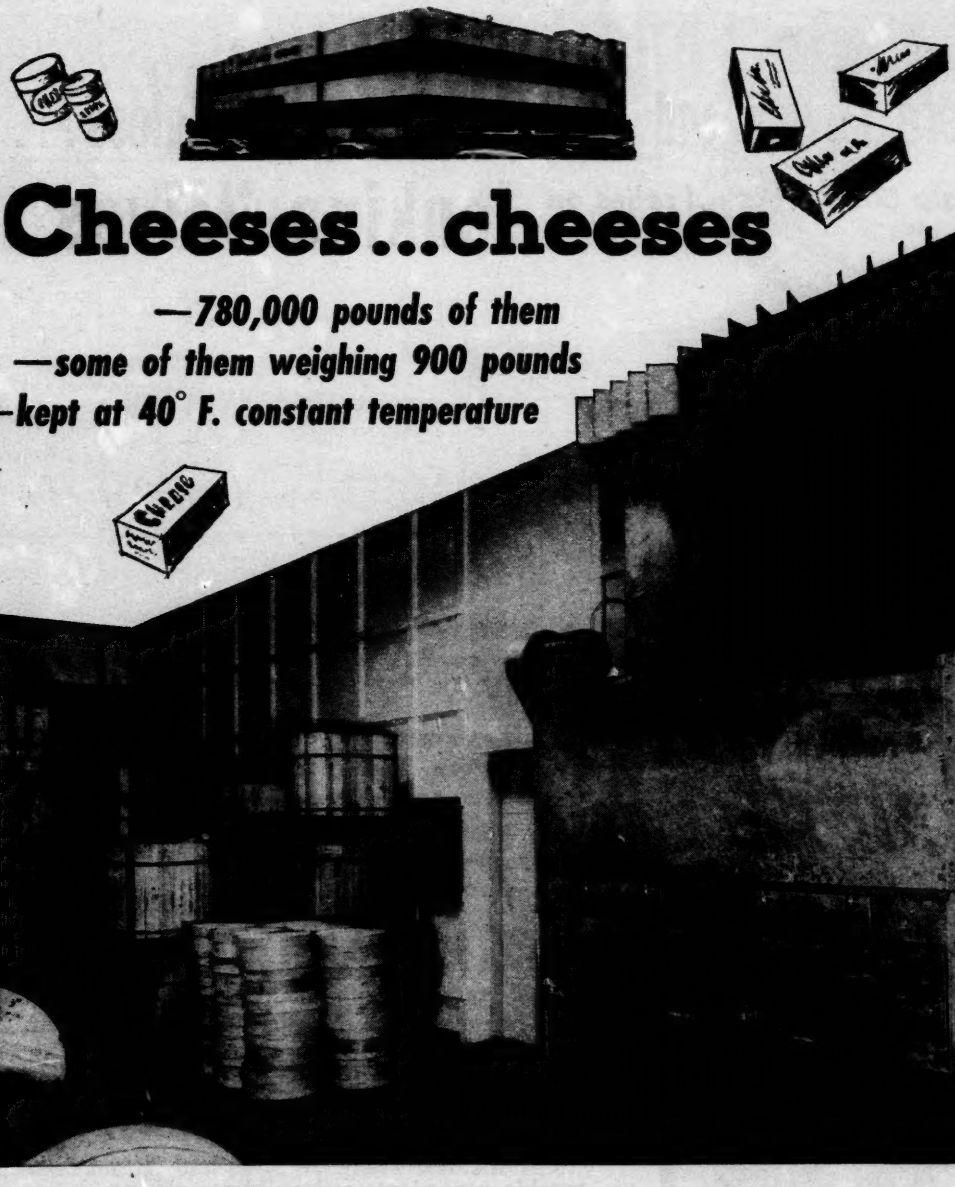
Jenkins builds *extra* endurance into valves — proved by low upkeep cost records in power plants both large and small. Yet, despite this *extra* value, *you pay no more* for Jenkins Valves. For new installations, for all replacements, let the Jenkins Diamond be your guide to lasting valve economy.
Jenkins Bros., 100 Park Ave., New York 17.
Jenkins Bros., Ltd., Montreal.

SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS EVERYWHERE

JENKINS VALVES

LOOK FOR THE DIAMOND MARK

TRADE JENKINS MARK



Cheeses...cheeses

—780,000 pounds of them
—some of them weighing 900 pounds
—kept at 40° F. constant temperature

At the San Francisco Plant of Kraft Foods Company, a *single ACME* Blo-Cold unit keeps the entire stocks at constant 40° F. More than three-quarters of a million pounds of Cheeses are stored in a room 40 x 60 feet. Some of the "big cheeses" weigh as much as 900 pounds. The single *ACME* Blo-Cold unit maintains a constant 40° temperature, easily and without any mechanical difficulty.

The versatility of the *ACME* Blo-Cold unit makes it adaptable to a wide variety of applications. Throughout the country thousands of Blo-Cold installations are giving good service and maintaining a reputation for dependable low-cost operation. Operational data and experience from these thousands of installations is your best guarantee of results, when you specify *ACME*. And don't forget that *ACME* Refrigeration Components are used by all the major job refrigeration companies.

Whatever your requirements, *ACME* engineers will cooperate in finding a simple low-cost solution to your problem. Write today — no obligation.

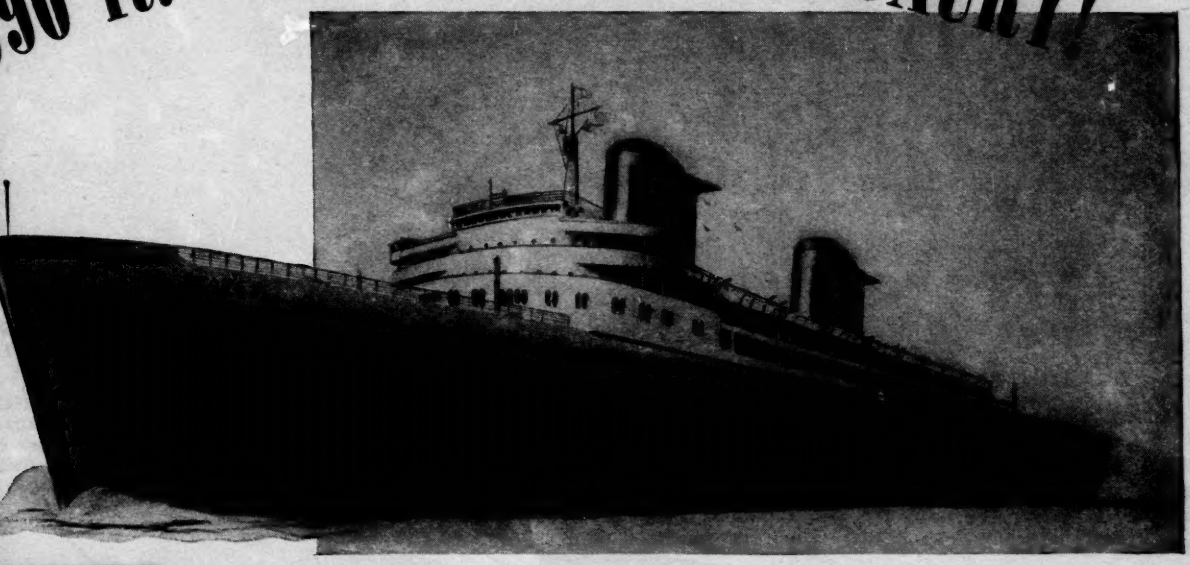
ACME PRODUCTS

ACME INDUSTRIES, INC., JACKSON, MICHIGAN, U.S.A.

Air Conditioning and Refrigeration Division

CONTINUOUSLY SERVING THE AIR CONDITIONING AND REFRIGERATION INDUSTRY SINCE 1919

90 ft. of air conditioned LUXURY!

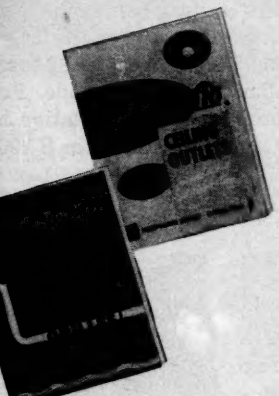


ARBER
OLMAN

uni-flo®

AIR DISTRIBUTION OUTLETS

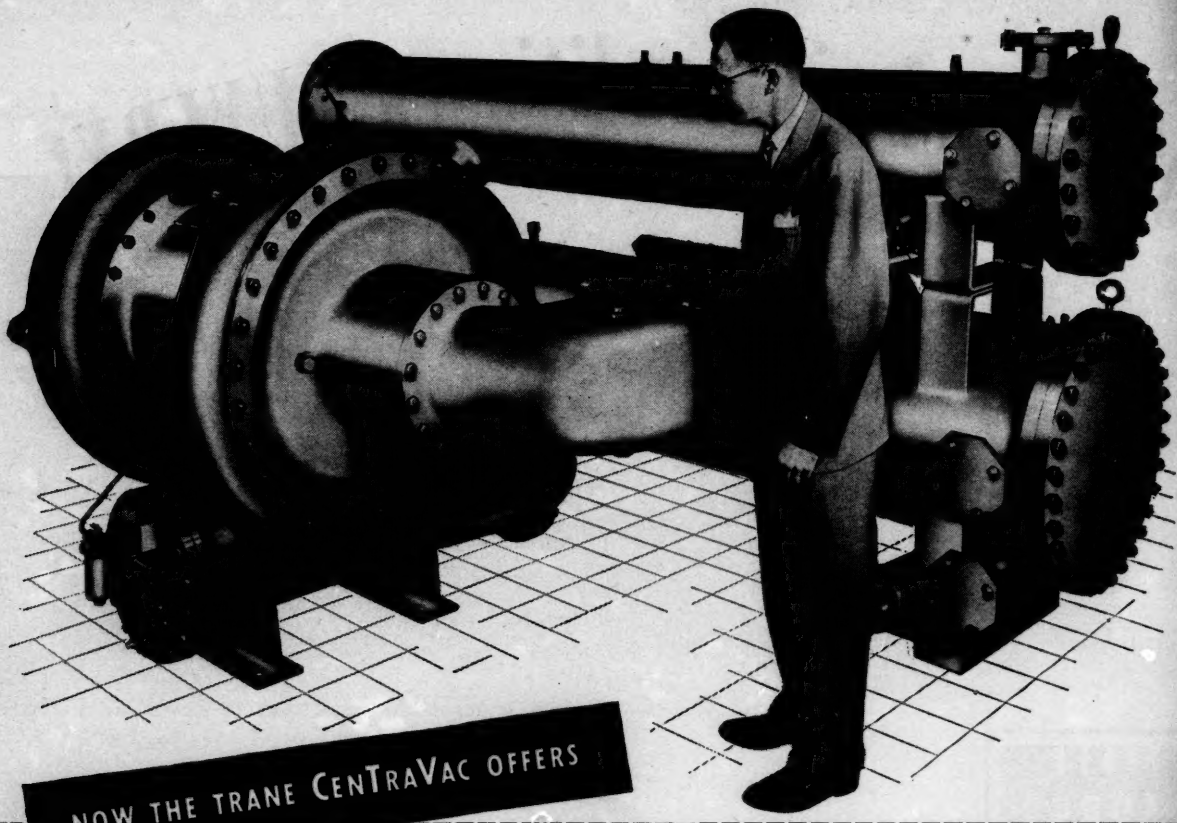
Used in New American Superliner



The UNI-FLO line of air distribution outlets is a broad one, encompassing units for almost every purpose in any type of building. Write for copies of the comprehensive literature we have on this subject — or let one of our engineers call and discuss your particular problems in detail.

By the time she goes into service, sometime in 1952, you are going to hear a lot of superlatives about the *S. S. UNITED STATES* — the "biggest, fastest, safest luxury liner ever built in this country." Not the least of these is the fact that it is the first superliner to be *air-conditioned throughout* — and the fact that the combination ceiling light and air diffusers are UNI-FLO special designs engineered and built by Barber-Colman. As with any job of this sort, it took a lot of collaborative effort on the part of Barber-Colman engineers, the ship's architects, the owners' representatives, and the ship builders to reach mutually satisfactory conclusions, but Barber-Colman representatives showed they had the skill and knowledge to cooperate on such a program to a successful result. When *you* travel on the *S. S. UNITED STATES* you will travel in new luxury, thanks in part at least to Barber-Colman and UNI-FLO.

BARBER-COLMAN COMPANY, 1224 ROCK ST., ROCKFORD, ILL.



NOW THE TRANE CENTRAVAC OFFERS

Centrifugal Refrigeration for the Small Job, Too

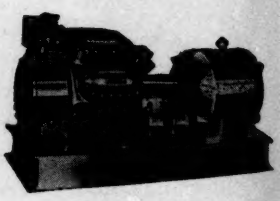
Now air conditioning installations as small as 45 tons can have all the advantages of centrifugal refrigeration. For years the flexibility, the safety and the economical operation of the centrifugal compressor were limited to the larger job. But Trane has changed all that with the CenTraVac.

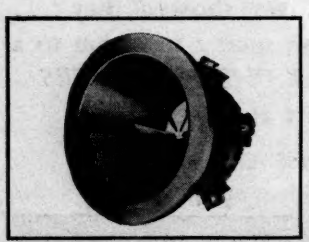
The CenTraVac is a completely self-contained, hermetically sealed water chilling unit. Light in weight—small sizes weigh under 15,000 pounds. It can be installed in basement or penthouse, in new or existing buildings. No special bases are necessary. Only simple water and electrical connections are required. First costs are surprisingly low. Push button operation eliminates the need for extra attendants —thus, maintenance costs are kept at a minimum.

Operating efficiently over a range from 100 to 10% of rated capacity, the Trane CenTraVac is ideal for the small job—industrial offices, precision manufacturing areas, small theatres, post exchanges. Yet, the CenTraVac is equally at home on the larger installations. It is available in five sizes to 190 tons. Single or multiple installation may be made. For more details, contact the Trane representative in your area or write for CenTraVac Bulletin S-399.

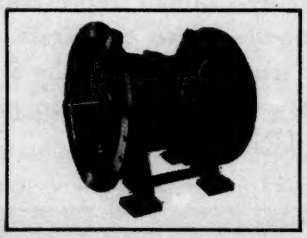
Trane Builds Both!

For applications in the 10 to 50 ton range, Trane manufactures a complete line of reciprocating compressors and condensers. These smooth, quiet operating units pack maximum capacity in a minimum of space.

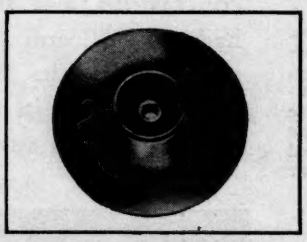




Saves Power—The exclusive Trane capacity control feature. Variable inlet guide vanes permit the unit to operate down to 10% of its rated capacity by regulating the flow of refrigerant into the impeller.



No Shaft Seals—Impellers mounted on a double extended shaft motor are hermetically sealed in this unit. Air, enemy of capacity, is sealed out. Maximum effectiveness is maintained at all times.

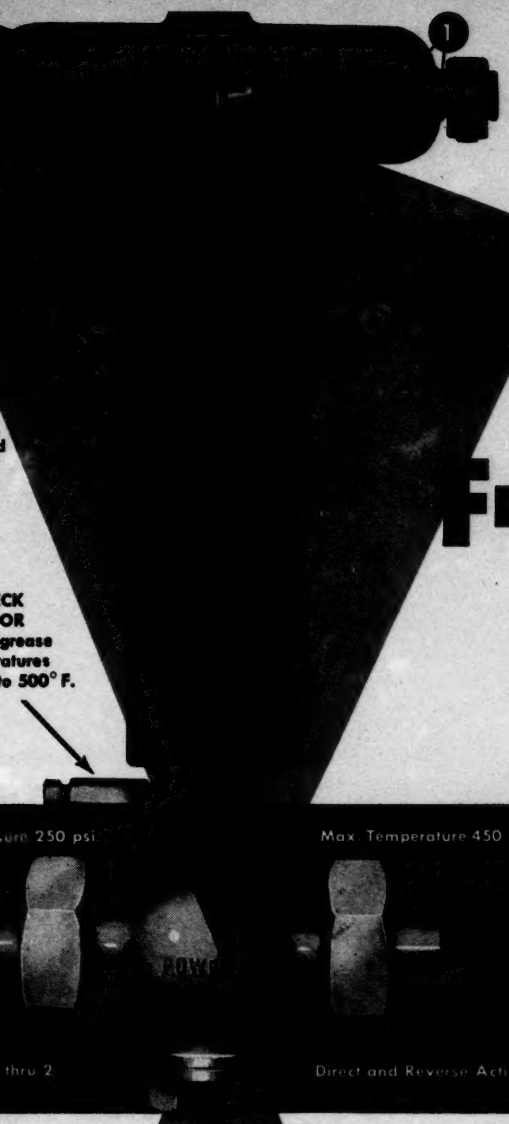


High Efficiency—True radial blade impellers produce flat characteristic curve—so desirable in centrifugal compressors. Curved buckets at each blade entrance also contribute to high efficiency.

TRANE

MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS.
Eastern Mfg. Division . . . Scranton, Pa.
Trane Company of Canada, Ltd., Toronto
OFFICES IN 80 U. S. AND 14 CANADIAN CITIES

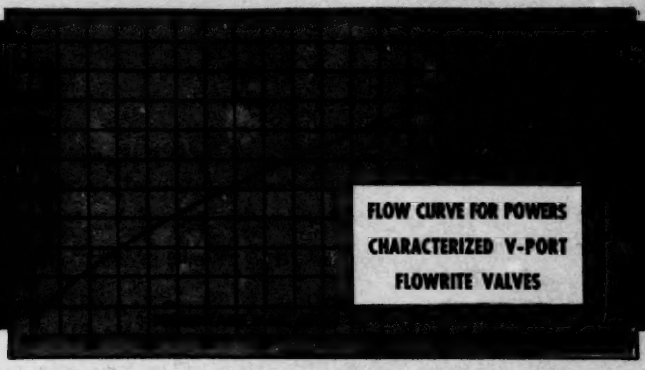


VALVE TOP—Durable moulded neoprene diaphragm (1) has positive sealing bead which provides increased sealing action with increasing control pressure. Efficient diaphragm form insures ample and constant operating power thru full travel. Piston Plate Assembly (2) has a free floating thrust plate which absorbs side thrust. Closely guided piston plate maintains stem in accurate alignment. Maximum air pressure in top, 22 psi.

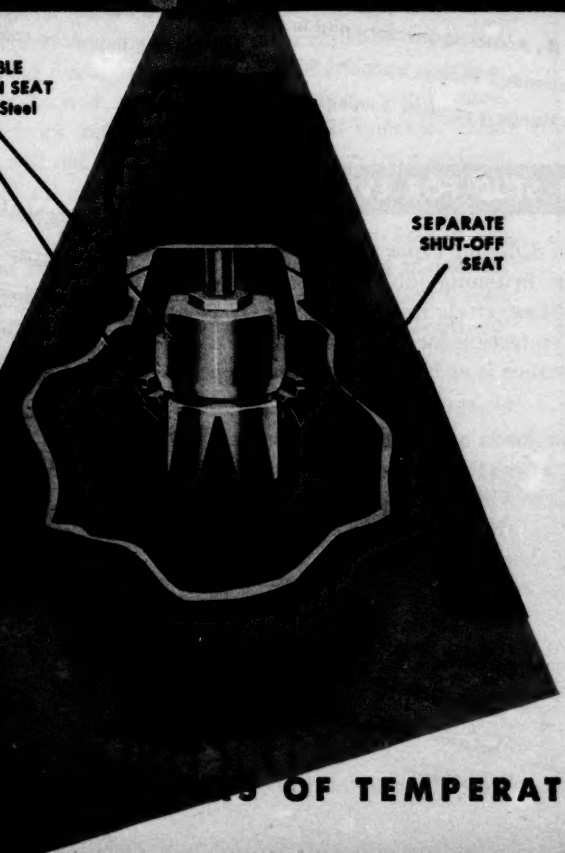
POWERS® SINGLE SEAT V-PORT *Characterized* FLOWRITE VALVES Give—

Special Flow Characteristics—High lift V-Port plug provides proportional flow throughout entire lift of stem as shown in chart below.

Wide Variety of Valve Sizes—Nine sizes are available, ½" thru 2". The ½" valve can be furnished with plugs to give 15%, 30%, 60% or 100% of maximum capacity. Plugs are easily interchangeable without removing valve from line.



FLOW CURVE FOR POWERS CHARACTERIZED V-PORT FLOWRITE VALVES



Better Control—Less Maintenance—Superior design of stainless steel plug and seat reduces wire drawing, insures longer life and tight shut off. V-Ports do the throttling, protecting separate shut off seat. Plug and seat are truly removable and can be easily replaced in the field. Inner valves are machined and precision ground and lapped within very close tolerances.

Low Hysteresis—Due to smooth rolling diaphragm and polished stainless steel stem in preformed lubricated packing.

Easy to Adjust—Ball bearing adjusting screw; rust proofed steel calibrated springs with full travel in 5 or 10 psi.

Easy to Install—Powers Flowrite V-Port valves have double unions and bronze body with rugged construction to withstand piping strains.

Easy to Service—Valve and top are easy to take apart and re-assemble, facilitating inspection and maintenance.

Reasonably priced. Contact our nearest office for prices and assistance in selecting proper size valves

THE POWERS REGULATOR CO.

SKOKIE, ILLINOIS • Offices in Over 50 Cities

Chicago 13, Ill., 3819 N. Ashland Ave. • New York 17, N. Y., 231 E. 46th Street
Los Angeles 5, Cal., 1808 West 8th Street • Toronto, Ontario, 195 Spadina Ave.
Mexico, D. F., Apartado 63 Bis. • Honolulu 3, H. I., P. O. 2735—450 Piikoi at Kona

...S OF TEMPERATURE AND HUMIDITY CONTROL

Sets Fastenin Stu tha

NEV

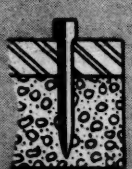
Speeds all these jobs — and many more!

1. Anchoring pipe hangers in concrete.
2. Fastening pipe stanchions in concrete.
3. Hanging instruments to concrete or brick.
4. Anchoring lavatory and laundry fixtures to concrete or steel.
5. Anchoring suspended ceilings, sprinkler systems and lighting fixtures to concrete.
6. Hanging radiator housings to concrete or brick.

It's fast, easy and safe to operate The Remington Stud Driver

Simply hand-assemble stud and power cartridge, load as a unit in easy-to-open Remington Stud Driver, and close.

Then press loaded Stud Driver firmly against surface, depress safety lever, and pull trigger.

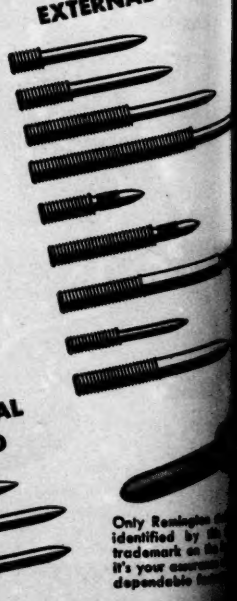


Explosive charge imbeds stud solidly. Open Stud Driver with a twist of the wrist, eject empty shell, load next stud. Whole job takes seconds!

THE RIGHT STUD FOR EVERY JOB

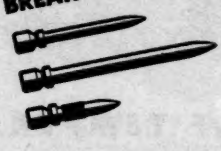
Studs are available in different types to meet the requirements of any specific fastening job. Made of a special, hardened steel alloy, these studs were developed by Remington after exhaustive testing for hardness, strength and profile. Pull-Out resistance is as high as two tons, depending on stud used.

Five different power loads are clearly indicated by colored plastic heel caps. These tough heel caps permit instant assembly of any cartridge with any Remington stud. Easily removed from the stud after driving, the heel cap also protects the thread of the driven stud.



STANDARD HEAD

BREAK-OFF HEAD



INTERNAL THREAD

Only Remington [illegible] identified by [illegible] trademark on [illegible] it's your assurance of dependable [illegible]

COMPACT ideal for [illegible] places. C

SPEED — [illegible] much as [illegible] studs at [illegible] dependin

ELIMINAT ered. Esp

FOUR W shows wh before a nently a against Driver w angle. Sl

RUGGED made of lightweig Lining c silient D

PRICE fo in rugge

uds up to 100 Times Faster
an Conventional Methods
...and Does it Safely!

REMINGTON STUD DRIVER

EW CARTRIDGE-POWERED
MODEL 450

LOOK AT ALL THESE FEATURES

ACT AND PORTABLE—Weighs only 5½ pounds, or scaffold, ladder, overhead work, inaccessible Comfortable to use in any position.

—One man can set up to 5 studs per minute, as as 100 times faster than other methods. Sets at whatever depth is required up to 2¾ inches, ding on material.

IATES INVESTMENT in outside power—Self-pow- Especially useful in isolated places.

WAYS SAFE—Plainly visible red dot indicator when it's cocked; safety lever must be depressed and during squeezing of main trigger; perma- attached safety shield must be compressed t work before Stud Driver will operate. Stud will not operate if tilted at more than a slight Slight recoil. Low noise level.

ED—All working parts of the Stud Driver are of heat-treated alloy steels, housing of strong, eight aluminum that carries no operating stress. of safety shield is a solid block of tough, re- Du Pont neoprene.

for Model 450 Remington Stud Driver complete ged steel carrying case—only $119.50.

Revolutionary tool fastens steel or wood to concrete or steel in seconds!

Speed construction fastening jobs and cut costs with the amazing new Remington Stud Driver. This lightweight fastening tool easily sets as high as 5 studs per minute. Easy to operate, it needs no outside power source . . . needs no other equipment!

The Remington Stud Driver is compact, rugged and safe. With one lightning-fast operation, it firmly fastens steel or wood structural pieces and fittings to concrete or steel surfaces.

Test-proved to be the world's finest and speediest fastening system, the Model 450 Remington Stud Driver is made by Remington Arms Company, Inc., *America's oldest and foremost sporting arms manufacturer*. To obtain detailed information on this time- and money-saving tool, and for the name of your nearest distributor, fill out and mail the coupon below.

DU PONT

Remington Arms Company, Inc.
Industrial Sales Division
939 Barnum Ave., Bridgeport 2, Connecticut

I am interested in obtaining descriptive literature on the Model 450 Remington Stud Driver.

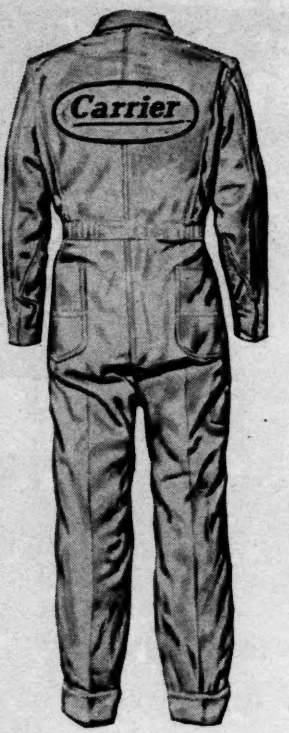
*Name*_____

*Firm*_____

*Position*_____

*Address*_____

*City*_____ *State*_____



Want a look at the overalls picture?

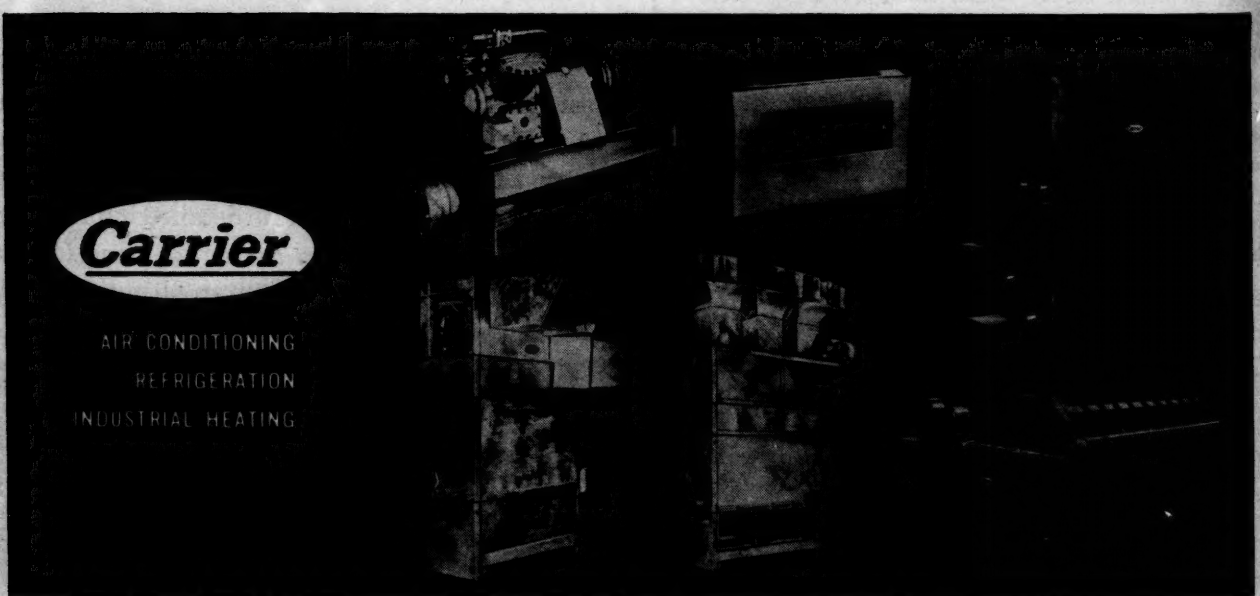
When we build the equipment you sell, we figure the Overalls Factor to be mighty important.

That's why there are always overalls in the Carrier picture. In all departments from drafting room to production line, there are men who have that certain "know-how" they got by working with equipment in a variety of applications.

It's only with their experience behind us that we can design and manufacture equipment that's going to do the job for your customers . . . that can be easily installed and serviced by you.

That's what makes the Carrier line so exceptional. It's a family of products built with you in mind . . . a family of products matched in size, performance and quality to put the most flexible air conditioning tools in your hands.

For instance . . . for small or medium size buildings there's a choice of systems to meet your needs. There's the Carrier low-pressure Weathermaster duct system with its volume control for individual rooms. And, for air conditioning the larger open spaces of multi-room buildings, such as meeting and assembly rooms, stores, restaurants and the like, there's the Carrier System and Zoning Weathermakers — each sectionalized to be fitted into your requirements for both comfort and industrial air conditioning. Carrier Corporation, Syracuse 1, New York.



REFRIGERATING COMPRESSORS DUCT WEATHERMASTER SYSTEM WEATHERMAKERS
EVAPORATIVE CONDENSERS COLD DIFFUSERS ZONING WEATHERMAKERS

THRUSH *Heating Manual*

ORTY
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AGES

Radiant Heat WITH FORCED CIRCULATING HOT WATER

HERE'S valuable help for you! Designing and in-
ing forced circulating Thrush Flow Control Hot Water Heat is greatly simplified by the many diagrams tables contained in this book. It has been improved and expanded to nearly double its previous size a large section on radiant heating engineering. Various zoning methods are fully described. One- and two-pipe flow control systems are illustrated and designed step by step for further simpli-ion. The book is in four parts. Boiler details are featured with appropriate wiring diagram shown each installation. Capacity tables are presented in new form for sizing of mains, branches and selec- of Thrush Equipment. Domestic water installations, unit heater hook-ups and even snow melting ications are covered. Installation of the complete Thrush Flow Control System has always been simple easy, but now you will find it easier than ever. The forty fact-filled pages of this new Thrush Manual be invaluable to you on every hot water job you install.

you are not now installing Thrush ment, it is time to get acquainted. our wholesaler or ask for more in-tion on the coupon.

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H. A. THRUSH AND COMPANY

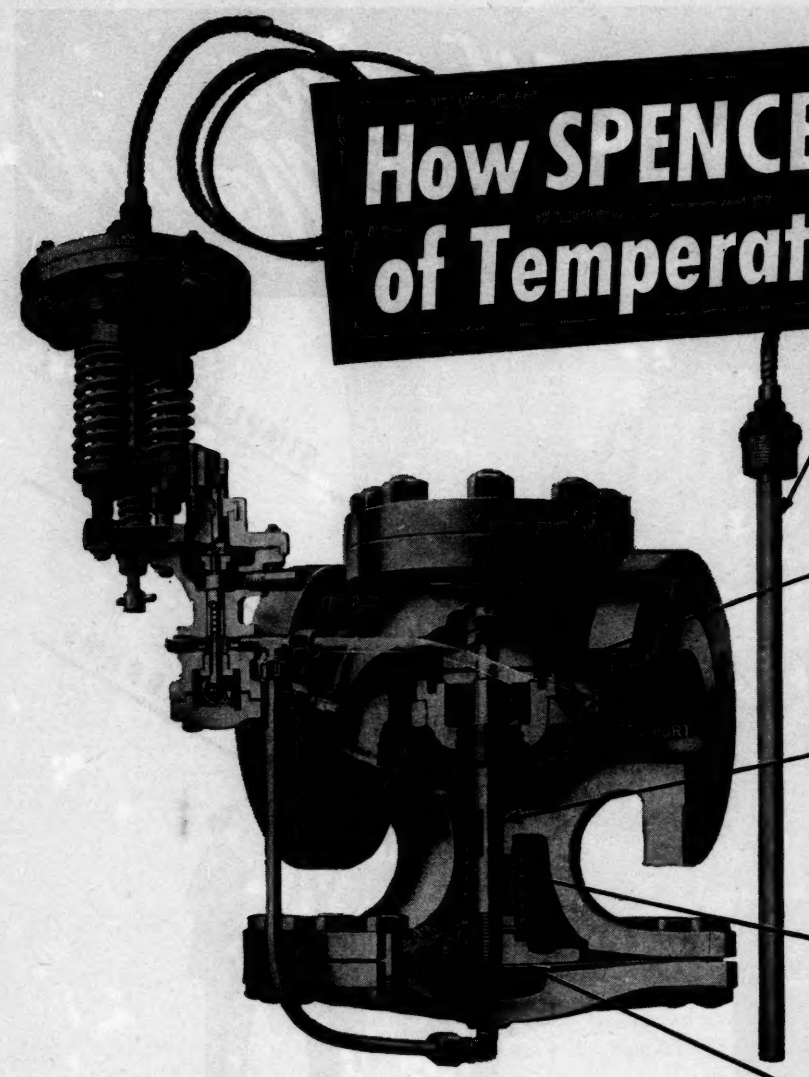
Department D-2, Peru, Indiana

- ☐ **We are using Thrush Equipment. Please send us your new, simplified Engineering and Installation Manual.**
- ☐ **We have not been users of Thrush Equipment but would like to have your literature.**

NAME _____

ADDRESS _____

How SPENCE Cuts Costs of Temperature Control



NEW THERMOSTAT ELEMENT—Improved to practically eliminate loss of filling. Rugged construction; cannot be injured by overheating.

SECO METAL—Seats and discs are made of SECO Metal—guaranteed not to wiredraw.

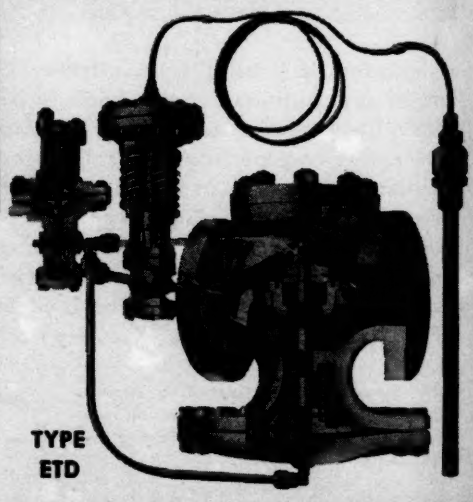
PACKLESS CONSTRUCTION — All Spence main valves and most pilots are built without stuffing boxes. This minimizes friction . . . eliminates much time-consuming maintenance.

PROTECTED SPRINGS — Springs in the Spence Regulator are out of the path of the steam or other fluid flowing through the valve.

LARGE BALANCED DIAPHRAGM— Spence metal diaphragms, under usual conditions, never require replacement.

...ature Control for Both ... Instantaneous Heaters

Spence Temperature Regulators reduce the steam pressure and also accurately modulate the flow as required to control the temperature. No separate reducing valve is necessary • The Spence ET150 Regulator is recommended for heater pressures up to 50 psi. For higher pressures the Type ETD is available • For complete details on the entire Spence line of automatic regulating valves, strainers and desuperheaters, write for Bulletin 1200.



TYPE ETD

SH 111

Spence

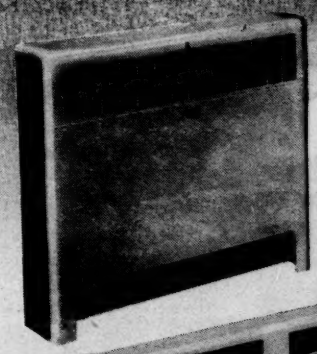
SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

1927 · 1952

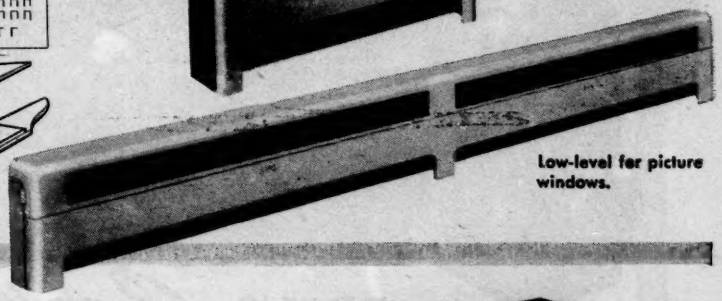
25 YEARS OF PROGRESS IN HEAT TRANSFER ENGINEERING

Young Quality ®

CONVECTORS

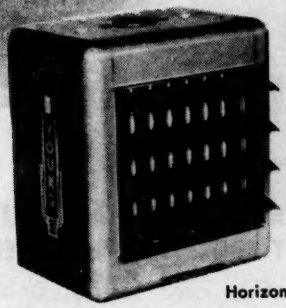


Standard free-standing, wall-hung, semi-recessed and fully recessed types.



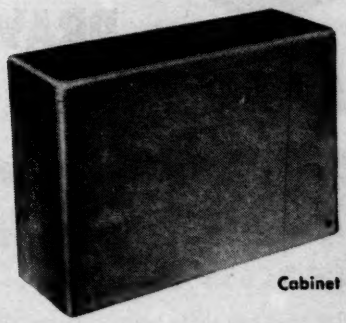
Low-level for picture windows.

KIT HEATERS



Horizontal Type

Vertiflow Type

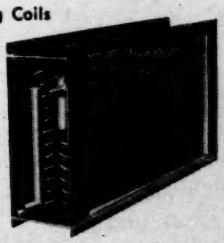


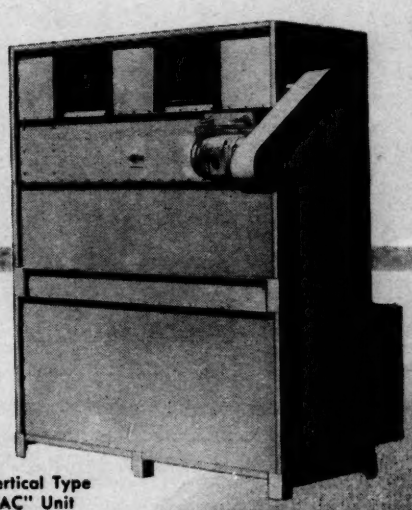
Cabinet Type

OILS

Heating Coils

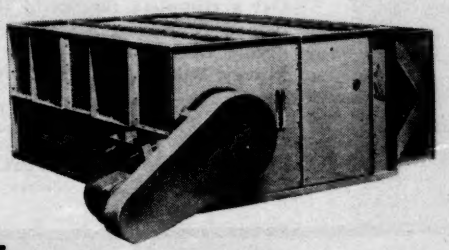
Cooling Coils





Vertical Type "YAC" Unit

AIR CONDITIONING UNITS



Horizontal Type "YAC" Unit

YOUNG

YOUNG RADIATOR COMPANY

DEPT. 522-B, RACINE, WISCONSIN

Factories at Racine, Wisconsin and Mattoon, Illinois
Sales and Engineering Offices in All Principal Cities

Heating, Cooling, and Air Conditioning Products for Home and Industry.

Heat Transfer Products for Automotive and Industrial Applications.

ANOTHER EXAMPLE OF VERSATILITY..

DRAVO *Counterflo* HEATERS GIVE 3-WAY SERVICE TO ABINGDON POTTERIES, INC.

1. MEDIUM-TEMPERATURE PROCESS DRYING...

In the combination casting and drying rooms fifteen Dravo *Counterflo* Heaters each provide 11,000 cu. ft. of warm air per minute to dry vitreous china castings and molds, maintain constant temperature and control humidity.

2. TEMPERING OF MAKE-UP AIR...

Exhaust fans remove 64,000 cu. ft. of air per minute from the eight booths in the glaze spray department. Direct-fired Dravo Heaters equalize pressure by bringing in fresh replacement air and warming it to comfortable working temperatures.

3. COMFORT HEATING AND VENTILATING...

Abingdon's mold shop is kept at a uniform 80° F. temperature by one Dravo Heater for the benefit of workmen making plastic molds. In summertime this unit is used for ventilation.

DRAVO HEATERS CAN SAVE YOU MONEY IN MANY PROCESS DRYING OPERATIONS

In addition to space heating, these versatile heaters can easily be adapted to nearly any type of medium-temperature process drying and curing operations, especially in farming, wood-working, textile, concrete, paper, plastic, painting and cleaning fields.

DRAVO HEATERS OFFER YOU...

- Low initial cost... users report 30% to 60% savings.
- Low fuel consumption... burn gas or oil.
- Easily converted.
- Automatic controls... on-off or modulating.
- Long service life, low maintenance... stainless steel combustion chamber.
- Mobility... can be moved to any location.
- Flexibility... can be mounted horizontally or vertically on floor, walls or ceiling.

WRITE FOR MORE INFORMATION

Get a complete report on how Dravo Heaters helped Abingdon Potteries with their process drying operation. Write for the complete case history, Bulletin No. RS-526-9

Listed by UL Approved by

DRAVO CORPORATION

HEATING DEPARTMENT
Dravo Bldg., Fifth & Liberty Ave.
PITTSBURGH 22, PA.

ATLANTA • BOSTON • CHICAGO • CLEVELAND • DETROIT • NEW YORK • PHILADELPHIA • PITTSBURGH
Sales Representatives in Principal Cities

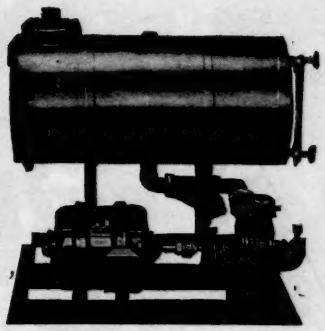
DRAVO

Manufactured and sold in Canada by Marine Industries, Ltd., Sorel, Quebec

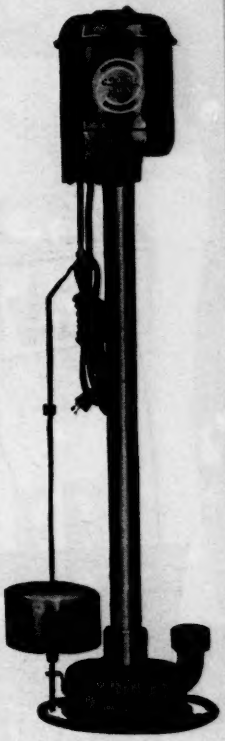
Export Associates: Lynch, Wilde & Co., Washington 9, D.C.

MANUFACTURERS OF QUALITY HEATING PUMPS FOR OVER A QUARTER OF A CENTURY

SKIDMORE PUMPS
For Every Requirement



TYPE TM PUMP — The Skidmore High Pressure Turbine Type Pump is designed with motor and steel receiver, completely assembled and mounted on either steel or cast iron base as desired. Pressures up to 150 pounds and boilers to 250 H.P.

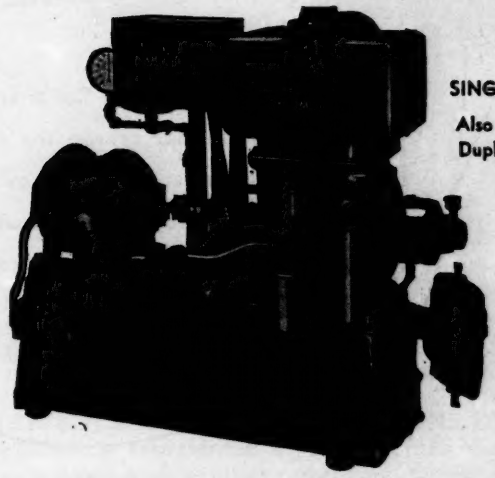


SKIDMORE SUMP PUMP — Dependable, light in weight but practical in design. The Skidmore Sump Pump is suited to a wide range of uses, and unusual working conditions, giving smooth, quiet operation. All bronze construction with copper float and stainless steel shaft. Capacity water removal of 3,000 gallons per hour.

TYPE CV VERTICAL PUMP — A sturdy package type condensate unit. Pump housing and motor are integral casting bolted to top of receiver—it can be installed in limited space—on floor level or in pit. Capacities range from 500 to 10,000 sq. ft. E.D.R. and discharge pressures from 10 to 20 pounds.

TYPE HS PUMP — Highly efficient pump economically designed, mounted on steel base, also furnished with cast iron base and cast iron receiver. Pump is bronze fitted throughout. Capacities ranging from 1,000 to 65,000 sq. ft. E.D.R. and discharge pressures from 10 to 75 pounds.

MAINTAINED SKIDMORE PUMPS EFFICIENCY



SINGLE UNIT

Also made in Duplex Unit

SKIDMORE VACUUM PUMP — Automatically adjusts itself to the varying conditions of the system. Liberal clearance between moving parts means Maintained Efficiency. Capacities ranging from 5,000 to 10,000 sq. ft. E.D.R.

SKIDMORE CORPORATION, ST. JOSEPH, MICHIGAN

Send complete engineering bulletins on the following Skidmore Heating Pumps checked below.

UV	VC	CV	TM	HS	SUMP PUMP	VACUUM PUMP

Name ---------- Position ----------

Company ----------

City ---------- State ----------

Want complete engineering data? SEND COUPON

There's Something in the Air *

AT THE TRAVIS

Hotel Travis of Dallas, Texas, an affiliated National Hotel. Air Conditioning Contractors: Texas Distributors, Inc.

The Hotel Travis in Dallas is offering its guests another reason for enjoying its facilities—an atmosphere in each room that can be *completely and individually controlled according to the comfort desires of each guest.*

The "silent partners" in this new guest-pleasing comfort are Marlo Remote Room Air Conditioners—each designed to cool, heat, ventilate and filter the air in individual rooms. No ductwork, either—just simple piping to carry the chilled or warm water.

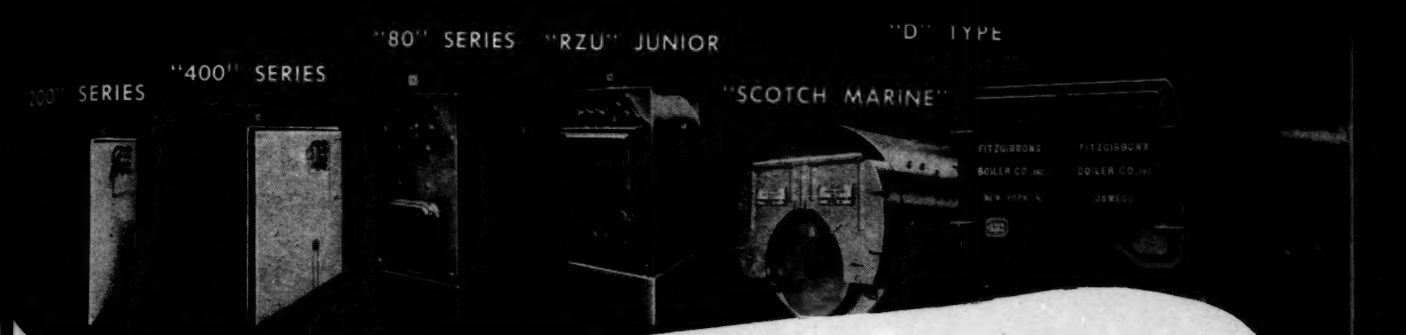
Two Marlo 75-ton Cooling Towers (out of sight, of course, in the cupola on the roof) complete the Travis comfort picture.

WRITE for information on the complete line of Marlo comfort-conditioning equipment.

Marlo
MANUFACTURERS OF

COIL CO. • 6135 Manchester Rd. • St. Louis 10, Mo.

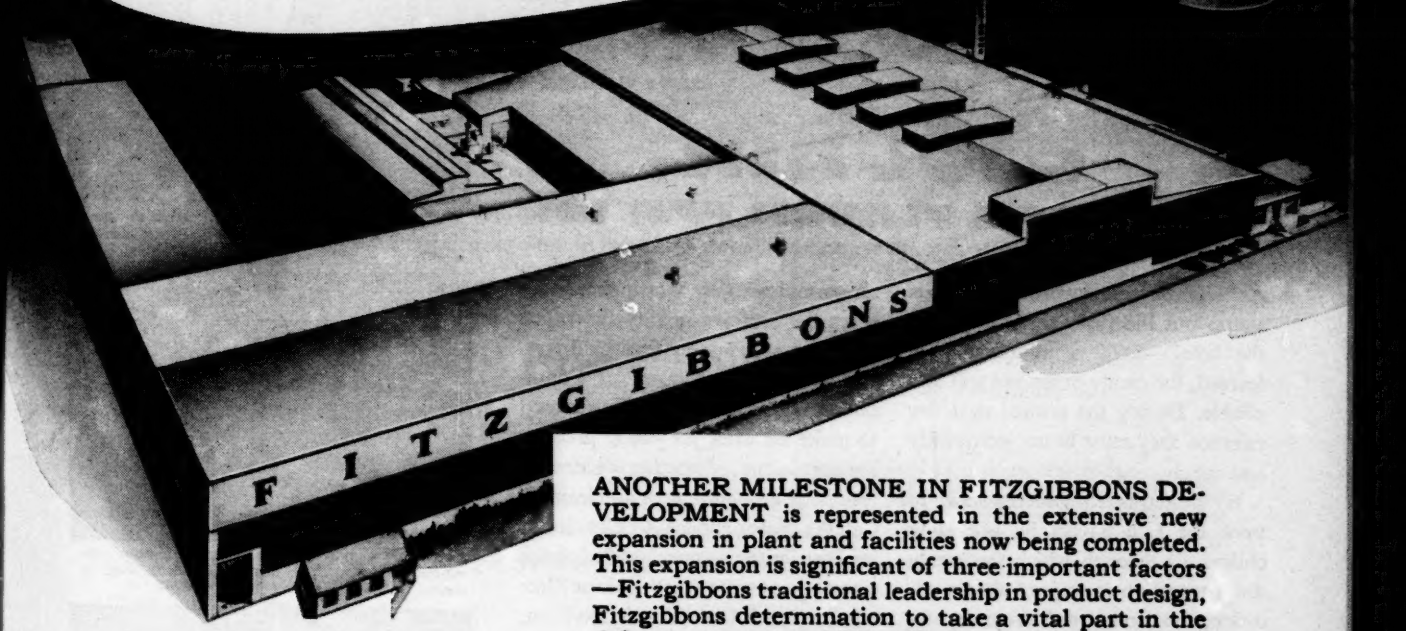
COOLING TOWERS • EVAPORATIVE CONDENSERS • INDUSTRIAL COOLERS
AIR CONDITIONING UNITS • MULTI-ZONE UNITS • BLAST HEATING & COOLING COILS



A steel boiler is a lifetime investment

—sell "the best in steel boiler heat"

THE FITZGIBBONS BOILER®



ANOTHER MILESTONE IN FITZGIBBONS DEVELOPMENT is represented in the extensive new expansion in plant and facilities now being completed. This expansion is significant of three important factors —Fitzgibbons traditional leadership in product design, Fitzgibbons determination to take a vital part in the defense program, and Fitzgibbons cooperation in meeting the problems of jobbers and heating contractors. The latter quality in particular will be further enhanced by the greatly enlarged facilities, which will clear the track for defense production without effect on boiler building . . . Now it will be easier still to do business with Fitzgibbons.

MOST ECONOMICAL IN FUEL
1886
THE FITZGIBBONS BOILER

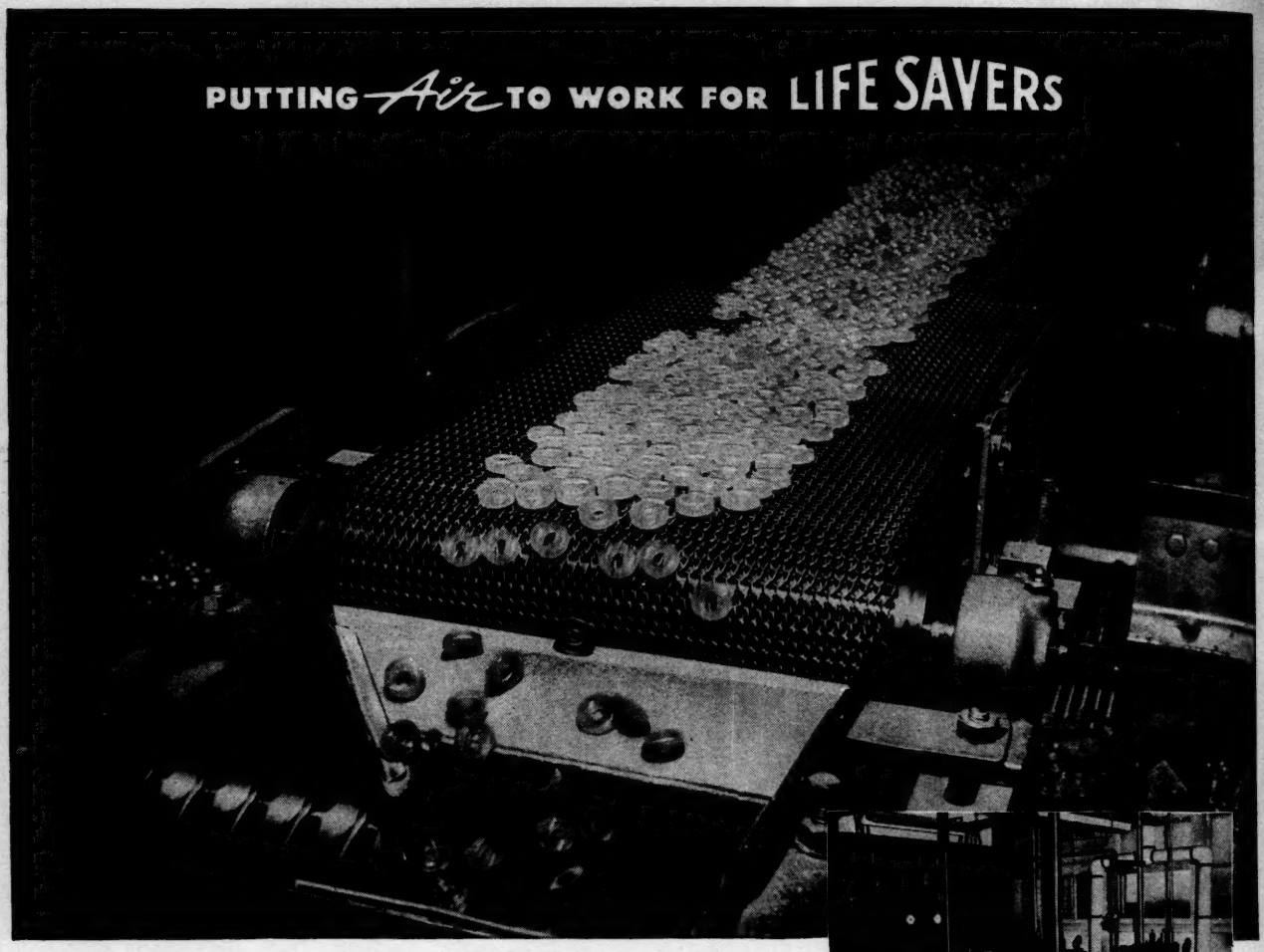
Fitzgibbons Boiler Company, Inc.

General Offices: 101 PARK AVENUE, NEW YORK 17, N. Y.

Manufactured at OSWEGO, N. Y. • *Branches in Principal Cities*

SBI

PUTTING *Air* TO WORK FOR LIFE SAVERS



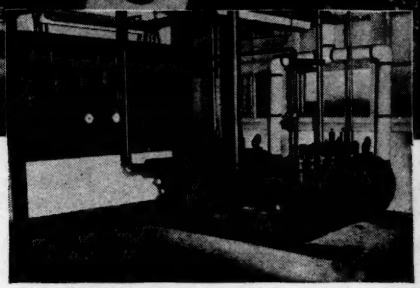
Air Conditioning by: J. P. Salmini Co., Inc., Bridgeport, Conn.

COOL AIR
STEPS UP A FLAVOR PARADE

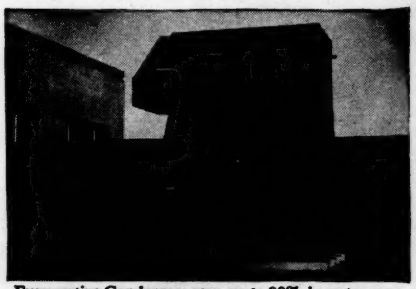
At Life Savers, intricate machines stamp out the familiar "candy with the hole"—3,600 a minute! When formed, the candy drops are soft and pliable. During the critical next few minutes, they must be cooled quickly and evenly.

Westinghouse equipment *puts air to work* for Life Savers by providing chilled air through which the candy drops travel on conveyor belts. In addition, the candy production department is air conditioned. Clean, cool air conditioning by Westinghouse assures the uniform quality for which Life Savers are famous the world over.

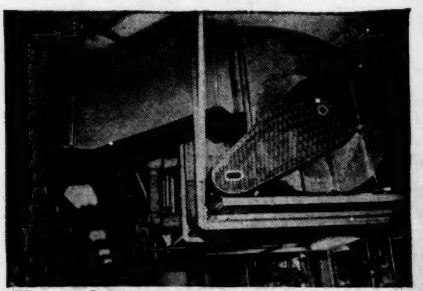
There's Westinghouse Air Conditioning equipment specifically designed to make air work *for you* in processing operations . . . whether it's air conditioning, air handling or air cleaning. Call the Westinghouse Air Conditioning Distributor in your classified phone directory, or write Westinghouse Electric Corp., Air Conditioning Division, Hyde Park, Boston 36, Mass.



Westinghouse Compressors are the heart of this cooling system. Hermetically sealed for maximum dependability.



Evaporative Condensers save up to 90% in water consumption. Designed for installation where water is scarce.



Silentvane® fans handle large volumes of air. Specially designed blade wheel delivers non-pulsating air flow.

YOU CAN BE SURE...IF IT'S

Westinghouse

J-80219

Streamline®

SOLDER TYPE GATE VALVES

for dependable, long lasting service

See your jobber for further information or write for catalogs S-351 and W-251 describing our complete line of STREAMLINE wrought copper and cast bronze fittings.

The new Streamline solder-type gate valve is built for durable operation in the 125# steam working pressure class of general service.

Its engineering design was perfected after many months of testing. Careful machining of seat and wedge disc gives positive shut-off with light pressure. Special lug design eliminates the possibility of installing disc backwards. And, non-rising stem allows installation in minimum amount of space.

The Streamline gate valve, which is furnished in a complete range of sizes from ½" nominal through 2" nominal, is an extremely rugged, seep-proof unit that will withstand the most severe usage and yet consistently give positive shut-off. Get the full facts today.

Streamline fittings are available in a complete range of standard sizes.

71

STREAMLINE PRODUCTS

MUELLER BRASS CO. PORT HURON 2, MICHIGAN

HERE'S EVERYTHING YOU WANT:
EFFICIENCY, ECONOMY, LOW MAINTENANCE

Versatile Unarco Amocel brings many proved advantages to the broad fields of general service, for—like Unarco's higher-temperature insulation, Unibestos—it's light, resilient, strong; won't pulp, powder, wash-off, or shatter. It withstands impact and vibration; is unaffected by moisture, steam, fumes, or the usual acids. No breakage in transit. Easy to cut and fit on-the-job. May be removed and reapplied repeatedly without damage or loss of efficiency. Insulating with Amocel is quick and clean—saves maintenance time and money. Get all the facts today.

Amocel is made in standard 3-foot lengths, and furnished as matching pairs of half-rounds with jacket applied. Metal bands included. Your Unarco Distributor has Amocel in stock. Call him, or write for literature.

UNIBESTOS-TYPE

Amocel

FOR TEMPERATURES TO 600°F; PIPE SIZES TO 12"

- **THE SAME** outstanding material—African Amosite.
- **THE SAME** attention to quality processing.
- **THE SAME** convenient application.
- **THE SAME** durability features.

Yet Unarco's long-lasting Amocel costs no more than ordinary pipe insulations.

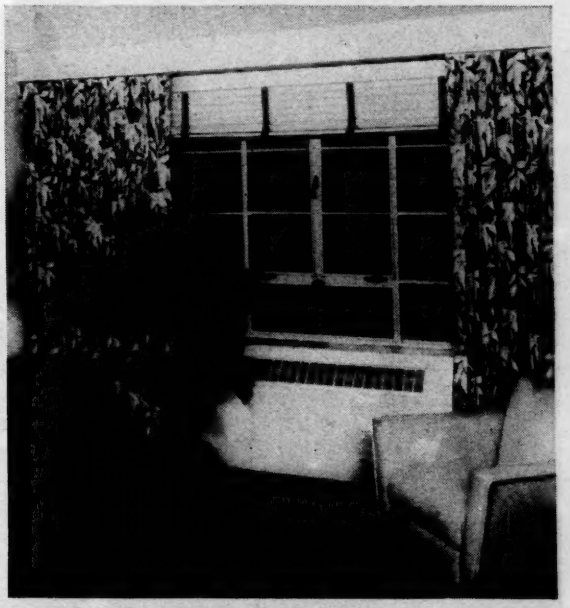
UNARCO

UNION ASBESTOS & RUBBER COMPANY

DEPT. B-2, 332 SOUTH MICHIGAN AVENUE : CHICAGO 4, ILLINOIS

IN STUYVESANT TOWN

Handsome "Metro" cabinet convector with "Metro" downfeed single riser behind draperies keeps rooms comfortable—*for less*—in Stuyvesant Town, N. Y.



SLASH INSTALLATION ...MAINTENANCE ...AND HEATING COSTS WITH "METRO"

SINGLE RISER HEATING

"Metro" piping with Dunham Vari-Vac* Temperature Controls keeps heat supply and demand in perfect balance . . . *always* . . . and for less. That's because "Metro" uses a *continuous* flow of steam at pressures and temperatures that *automatically vary with outside weather.*

Metropolitan, Equitable, and New York Life Insurance Companies have found "Metro" with Dunham Vari-Vac a sound investment for their housing projects . . . so have investors in smaller buildings . . . because:

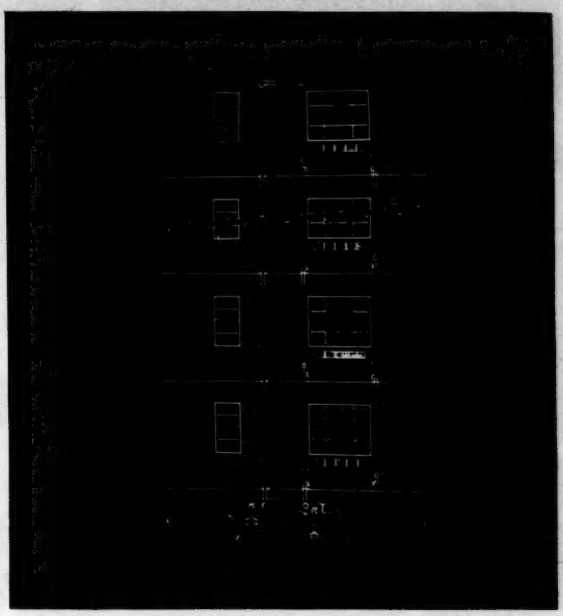
"METRO" costs less to install. It eliminates all radiator branches, expansion joints, and swing connections—no traps and valves in occupied quarters. Permits precutting of risers to one size. Eliminates settings for temporary heat. Eliminates costly furring of masonry walls and ceilings.

"METRO" costs less to maintain. No small radiator fittings to break down. Eliminates *all* cost of valve maintenance—90% of trap maintenance.

"METRO" costs less to operate. Used with Dunham Vari-Vac Controls, fuel savings as high as 40% are not at all uncommon. "Metro" never is guilty of overheating or underheating.

See your Dunham Sales Engineer for complete information—or write for Bulletin 2202-16. No obligation.

**Variable Vacuum*



IN ANY TOWN

"Metro" single riser heating provides an uninterrupted path for flow of steam from top to bottom of building. A continuous pipe passes down through overlying rooms . . . is offset into a convector or baseboard in each room.

Send for Free Bulletin 2202-. . Full of helpful information about this amazingly economical heating system. Includes all essential design details, application data, and typical piping hookups.

DUNHAM

heating systems and equipment

C. A. DUNHAM COMPANY

400 W. Madison Street, Chicago 6, Illinois

In Canada: C. A. Dunham Co., Ltd., Toronto
In England: C. A. Dunham Co., Ltd., London

Radiation • Unit Heaters • Pumps • Specialties

ASK THE AEROFIN MAN

For the Practical Answer to Your Heat-Exchange Problem . . .

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

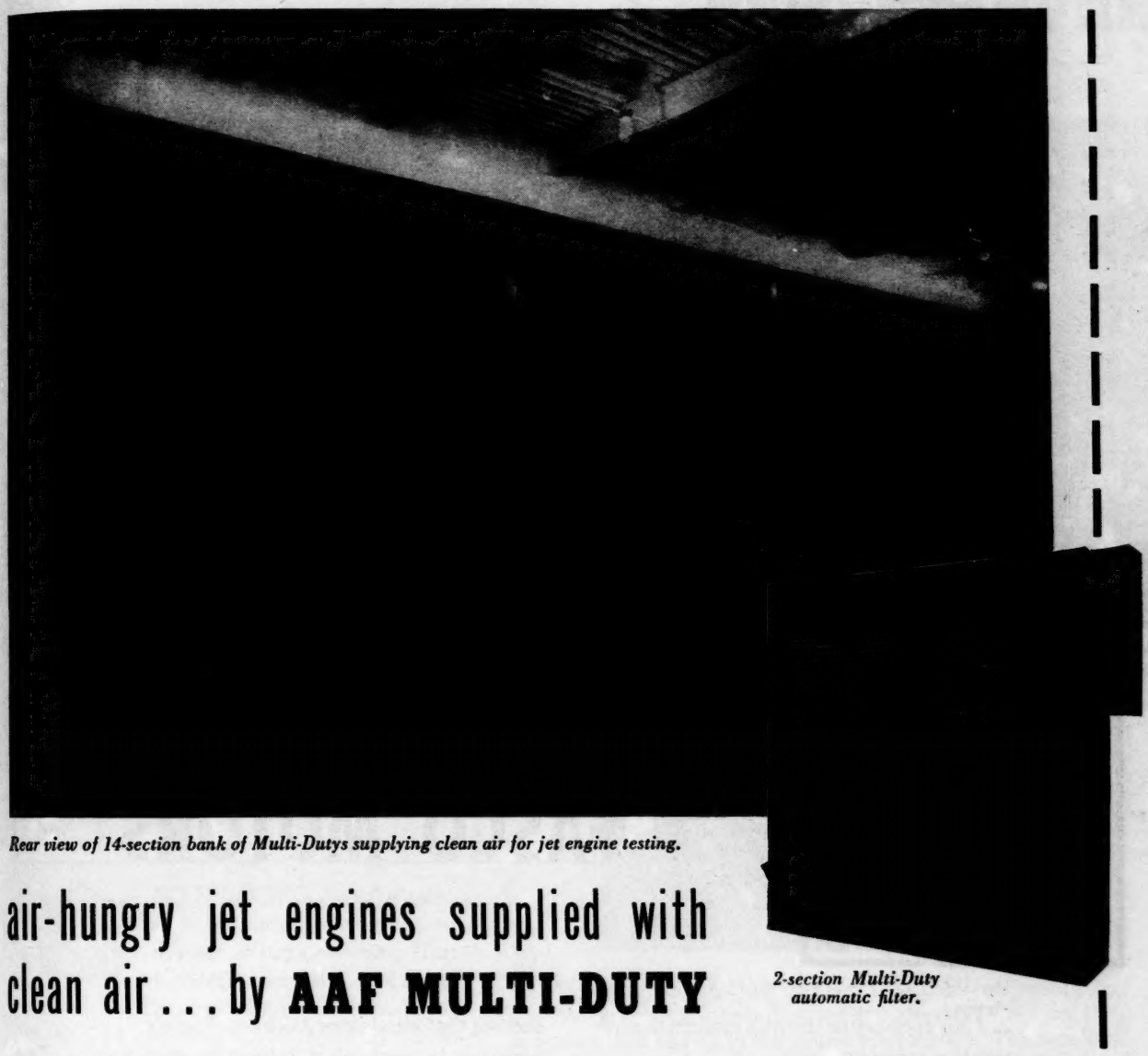
There is a competent Aerofin heat-transfer engineer near you, qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem.

This specialized knowledge is there, ready for you to use to your greatest advantage. Ask the Aerofin man — and be right.

AEROFIN CORPORATION

410 South Geddes St., Syracuse 1, N. Y.

air as clean as you like it!



Rear view of 14-section bank of Multi-Dutys supplying clean air for jet engine testing.

air-hungry jet engines supplied with clean air . . . by **AAF MULTI-DUTY**

2-section Multi-Duty automatic filter.

Jet engines consume enormous air volumes. In factory test areas this air must be *cleaned* to protect the impeller blades and air foil surfaces.

The 14-section installation of AAF Multi-Duty Air Filters shown here is one of a double bank supplying *clean air* to the test area of a large jet engine manufacturer. The Multi-Duty is an ideal filter for this type of application where constant clean air volume is required. It is fully automatic and self-cleaning . . . assuring maximum operating efficiency at all times without dependence upon the human element. Also the exclusive principle of overlapping panel construction in the Multi-Duty has never been surpassed as the most practical method of combining the function of self-cleaning with the operating cycle. This AAF filter is used in many industries and is available in any size or capacity.

You may not manufacture jet engines. However, if *clean air* for test operations or precision processes is one of your problems, call your nearby AAF representative. His solution will be based on AAF's complete line of engineered air filters and thirty years experience supplying *clean air* to industry. Write for Multi-Duty Engineering Bulletin No. 241A.

American Air Filter
COMPANY, INC.

294 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, California

To work both ends with the middle...

A typical set-up for a room air-conditioner, with a 6-pole Fasco Motor (Model 3A) driving an impeller for positive air movement—and a propeller blade for cooling the condenser.

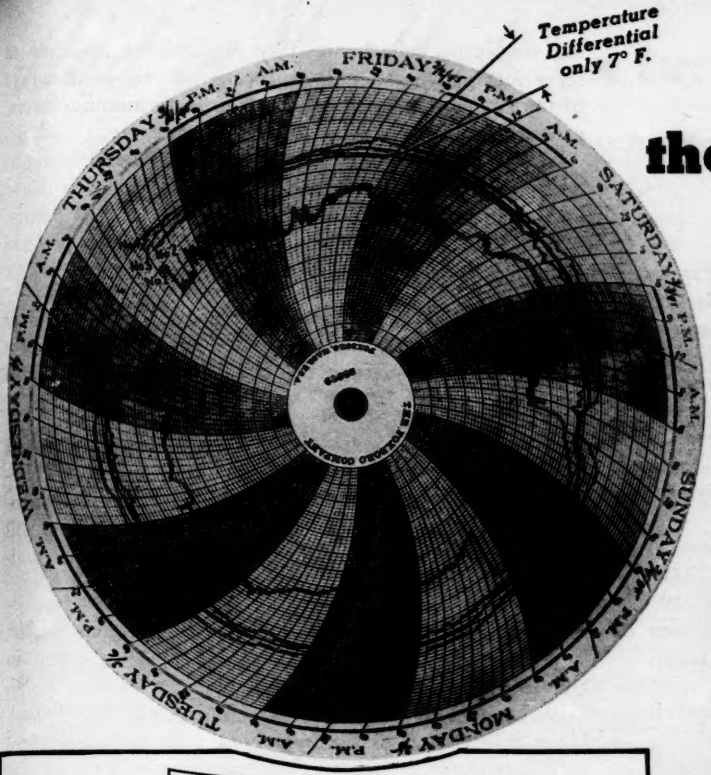
and work them well, use FASCO MOTORS

This application shows a modern shaded pole motor at its best.

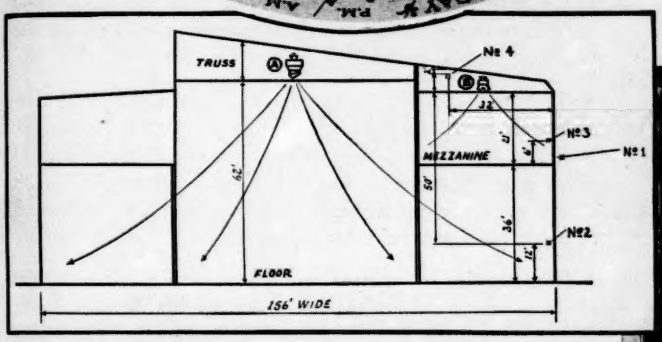
There's power to spare (up to ⅛ hp) carried smoothly by a rugged ½" shaft. There's accurate balancing for vibration-free performance . . . and resilient mounting to keep the noise level very low. There's low speed (about 1000 RPM), speed that's controllable . . . and engineering that eliminates AC hum. There's precision in mechanical tolerances that assures long life and quiet operation. There's no interference with radio or TV reception. And there's real economy—despite the fact that Fasco Motors are engineered specifically for the job . . . and produced only after exhaustive study of the application.

Fasco engineers will be glad to work with you on your small motor problems . . . in your own plant if you wish. Just write.

FASCO
INDUSTRIES, INC.
ROCHESTER 2, NEW YORK



The Story of the TEMPERATURE CHART



(Above) Main section of building showing 6 of the 10 large Wing Revolving Heaters 62' above the floor.

(Left) View on the mezzanine, showing the smaller Wing Revolving Heaters located 21' above the mezzanine floor.

REPLACING an expensive but inadequate heating system, Wing Revolving Unit Heaters completely solved a difficult heating problem in a shipbuilding plant. The building is 156' wide by 62' to the cross beams by 802' long. A mezzanine is 42' by 21' to the cross beams by 802' long.

Ten Wing Revolving Unit Heaters with one-way revolving discharge outlets cover the section marked "A" on the diagram and shown in the upper photograph. Ten smaller Wing Revolving Unit Heaters with Design No. 8 revolving outlets cover the mezzanine shop marked "B" on the diagram and shown in the lower photograph. Fairly high working temperatures (75° F) were required and furnished. The chart from a recording thermometer, with bulbs located as shown, reveals graphically the even working temperatures, the relatively low ceiling temperatures and the fluctuating outdoor temperatures (32° to 75° F) over one week's time.

Wing

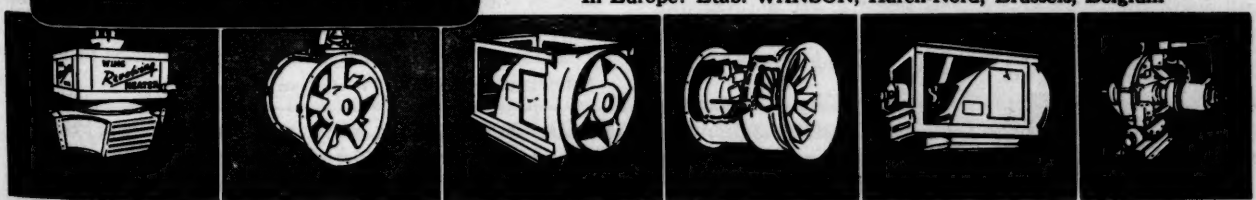
REVOLVING UNIT HEATERS

Write for further details and a copy of Bulletin HR-6

L. J. Wing Mfg. Co., 158 Vreeland Mills Rd., Linden, N. J.

Factories: Linden, N. J. and Montreal, Can.

In Europe: Etab. WANSON, Haren-Nord, Brussels, Belgium



BRIEFLY STATED

• The Office of Price Stabilization filed petitions January 11 to intervene in three natural gas rate cases before the Federal Power Commission which propose rate increases totaling some $26,000,000 and affecting most natural gas users in the eastern and southern section of the country.

The Transcontinental Gas Pipe Line Corp. proposes to increase its rates to wholesale customers by approximately $13,900,000 for the year 1952. This company supplies 52 resale customers in the states of New York, New Jersey, Pennsylvania, Alabama, Georgia, Louisiana, North Carolina, South Carolina and Virginia.

Atlantic Seaboard Corp. and Virginia Gas Transmission Corp. of which Atlantic is a parent company, have requested rate increases estimated at $3,036,976 or 15.3% over present rates. These two pipeline companies own and operate an integrated, interstate, natural gas transmission system extending from Boldman, Ky., to a point on the Maryland-Pennsylvania state line. They supply 8 resale customers.

An estimated increase of $9,718,949 in rates is proposed by the United Fuel Gas Co., Charleston, W. Va. This company serves 77 communities in the West Virginia-Ohio-Kentucky area and has 11 resale customers, most of which are subsidiaries of the Columbia Gas System.

These three bring to 9 the number of natural gas cases before the FPC in which OPS is taking part. All together, they involve increases of approximately $80,000,000 per year in the wholesale price of gas.

These rates are not subject to direct price control by OPS but must be approved by the Federal Power Commission. However, under the Defense Production Act, public utilities making application for an increase in wholesale rates must notify OPS and must consent to intervention by the agency in proceedings before the regulatory body.

• The New York Public Service Commission ruled December 14 that the Consolidated Edison Co. could not convert any more New York City customers to natural gas until the commission had received assurances that alternate sources of supply for emergency service had been constructed. Commission Chairman Benjamin F. Feinberg specifically denied the utility permission to convert 17,000 customers in the Riverdale section of the Bronx and Marble Hill in Manhattan. He stated that the holdup would also affect 990,000 customers in the Bronx, Queens and Manhattan who are still using manufactured gas. Consolidated Edison has already converted facilities for 210,000 of its 1,200,000 customers. Transcontinental Pipe Line Corp. has only a single line into the city at present, although another is being constructed under the Narrows between Staten Island and Brooklyn. It is not expected that this additional line will be completed before May.

• With the object of improving the quality of hot water, steam heating, air conditioning and refrigeration installations, the Heating, Piping and Air Conditioning Contractors' Chicago Association maintains an engineering standards department. The department attempts to serve local architects and engineers, as well as members of the association, with information as to manufacturers' products and the results of scientific research and development. The general public may consult the association's engineer, E. R. Teske, with regard to their home heating problems and selection of systems for new homes. Members of the association may submit working plans of any proposed work to the engineering department.

• Lyman D. Warner has been appointed vice president in charge of market and product development and promotion for the American District Steam Co., Inc., North Tonawanda, N. Y.

• A home air conditioner section is in process of being organized within the Air Conditioning and Refrigerating Machinery Association. Under the chairmanship of J. A. Gilbreath of Servel, Inc., the new group will be a part of the association's self-contained air conditioner section.

• In place of sheet metal for the cold-air ducts of the forced-air oil heating system of his new residence in Harrisburg, S. D., Al Bunkers, manager of the H. W. Ross Lumber Co., used Masonite ⅛-inch Presdwood. Floor joists were used as channels, with the Presdwood nailed underneath. Where the channels ran opposite the joists, a drop-down of 1x3 lumber was used.

• The board of directors of The Torrington Manufacturing Co., Torrington, Conn., have elected Dudley B. Robinson to the position of vice president in charge of sales. Mr. Robinson joined Torrington in 1949 as sales director of the air impeller divison and had advanced to position of general sales manager, prior to this election.

• Construction of a new one story factory with 92,000 sq. ft of floor space has been started in Melrose Park, Ill., for Yeomans Brothers Co. Occupancy by the manufacturer of pumps and waste treatment equipment is scheduled for Fall of 1952.

• The Midwest Power conference has been renamed the American Power conference, it was announced by R. A. Budenholzer, conference director and professor of mechanical engineering at Illinois Institute of Technology. The name was changed to more accurately describe the scope and character of the conference, Budenholzer said. The 13 annual Midwest Power meetings have attained wide geographical and scientific significance. The first annual American Power conference will be held March 26, 27 and 28 at the Sherman hotel. Illinois Tech will continue to sponsor the meeting and the same group of schools and societies will participate.

• Dr. H. J. Rose, vice president and director of research of Bituminous Coal Research, Inc., has announced that Henry H. Russell has been employed as a development engineer on the Pittsburgh staff of the national research agency of the bituminous coal industry. Mr. Russell, formerly a process engineer with the Chemical Plants Division of Blaw Knox Construction Co., will be primarily concerned with improving coal utilization.

• Designation of a sales manager for its General Products Division and major rearrangement of assignments of two vice presidents have been announced by Owens-Corning

And in New York - A FUTURE OF FAULTLESS SERVICE

SIXTY SUTTON PLACE SOUTH
New York City
ARTHUR WEISER
architect
RUTHERFORD L. STINARD
mechanical engineer
PAUL TISHMAN COMPANY
general contractors
JOHN WEIL PLUMBING CORP.
plumbing contractor
SMOLKA CO., INC.
wholesale distributors

Here at New York's smartest new address and newest COYNE & DELANY installation, the fine touch of exacting planning is everywhere evident.

Fronting on the famed Franklin D. Roosevelt Drive immediately north of the United Nations site, this 19 story luxury dwelling will offer exciting river views from private terraces. Among other features are individual apartment air conditioning, unique in New York, and an enclosed two level garage. Complimenting these niceties in each apartment will be the matchless performance of nearly 600 COYNE & DELANY diaphragm type FLUSH VALVES — selected where only the best will do.

Another singular advance in flush valve design is the newly engineered "Rubberflex" sealed handle unit — now available on all DELANY models. Springless and packingless, and consisting of only four parts (as shown in exploded view at left), the "Rubberflex" provides a wall of impervious rubber to reduce the chronic annoyance of leaking and sticking handles.

DELANY *Flush* VALVES

COYNE & DELANY CO. • 834 KENT AVE. • BROOKLYN, NEW YORK

Since 1879

Fiberglas Corp. Ben S. Wright, vice president since 1949 and general sales manager since 1947, was reassigned as vice president in charge of purchasing and trade relations. E. W. Smith, who was appointed vice president and director of merchandising last May, was reassigned as vice president in charge of sales branches and training programs. Edward J. Detgen was named sales manager of the General Products Division. All will make their headquarters in the Owens-Corning general offices in the Nicholas Building, Toledo.

• William F. Carolan has been appointed general sales manager of the newly created air-conditioning department, of the RCA Victor Division, Radio Corporation of America. The appointment became effective December 17. Mr. Carolan's headquarters will be in the Company's home office in Camden, N. J. For two years prior to joining RCA Victor, Mr. Carolan was sales manager of the E. B. Lathan Company, electrical distributors in New York City. Previous to that, Mr. Carolan was sales manager of the New York office of Hotpoint, Inc.

• White-Rodgers Electric Co., St. Louis, has announced the appointment of Richard H. Ewert as general manager, Office Sales Division. His responsibilities will embrace all inside sales activities. Mr. Ewert was formerly assistant sales manager and mechanical engineer of Illinois Gear and Machine Co., Chicago, and more recently was staff engineer, Barco Manufacturing Co., Chicago.

• The National Warm Air Heating and Air Conditioning Association has announced the election of new officers and members of the board of trustees for 1952. Nominated and unanimously elected at the 38th annual convention of the association was W. D. Redrup, Majestic Co., as president; C. B. Phillips, Surface Combustion Corp., first vice president; and G. W. Denges, The Williamson Heater Co., second vice president. Nominated and reelected for a second term as members of the board of trustees were R. M. Cook, Thatcher Furnace Co.; H. G. Cross, Waterman-Waterbury Co.; M. I. Levy, Viking Air Conditioning Corp.; and L. S. Redford, Jackson & Church Co. T. I. Byrd, Lau Blower Co., was also nominated and elected to the board of trustees to fill the vacancy created by the election of G. W. Denges to second vice presidency.

• Philip M. Stephenson has been elected president of the Aldrich Co., manufacturers of Heat-Pak boiler-burners and Aldrich Crop Driers for farm products. The new president has been vice president and general manager of Aldrich, with headquarters and main plant in Wyoming, Illinois, since shortly after the firm became a subsidiary of Breeze Corporations, Inc., in 1947.

• McQuay Inc., Minneapolis manufacturers of heating, air conditioning, and commercial refrigeration equipment, has announced the appointment of Donald F. Coones as assistant treasurer, Byron E. James, vice president in charge of engineering and research, and Donald P. Wilson, vice president in charge of manufacturing. Mr. Coones joined McQuay nine years ago as comptroller of the company. In 1949 he was appointed assistant secretary, which title he will continue to hold. Mr. James came to McQuay in 1949 and since that time has directed the engineering department. Mr. Wilson has been with McQuay for fifteen years with assignments in production, tool design, plant layout, material control, and labor relations fields. He is currently in charge of production at McQuay's three manufacturing plants.

• The first International Conference on Underground Gasification of Coal, to be sponsored jointly by the Bureau of Mines and the Alabama Power Company of Birmingham, Ala., will be held February 12-14 instead of January 28-30 as originally planned. The postponement was necessary in order to permit greater participation by European scientists in the sessions, which will be held at Birmingham and Gorgas, Ala.

• C. A. Dunham Co. has appointed E. W. Cardiff as advertising manager. Formerly acting manager of the marketing and promotion department, Mr. Cardiff, aged 31, has been with the Chicago manufacturer of heating systems and equipment for three years. Prior to joining Dunham, Mr. Cardiff was a partner in a product design firm and advertising agency, Pellegrin and Cardiff, in Woodstock, Illinois.

• Effective January 1, 1952, the Magnesium Sales Department, The Dow Chemical Co., will assume distribution of cathodic protection products from Dowell, Inc., a wholly-owned subsidiary. This change was made to effect closer coordination between research and development, production, and sales of magnesium anodes. Dow will now handle distribution of anodes, including cast magnesium anodes used extensively to protect metal structures, underground pipe lines, steel piers, and ship hulls from corrosion; Galvoline, a cored magnesium ribbon for underground installation using cable laying plows; and the cored magnesium rod for protecting hot water storage tanks from corrosion.

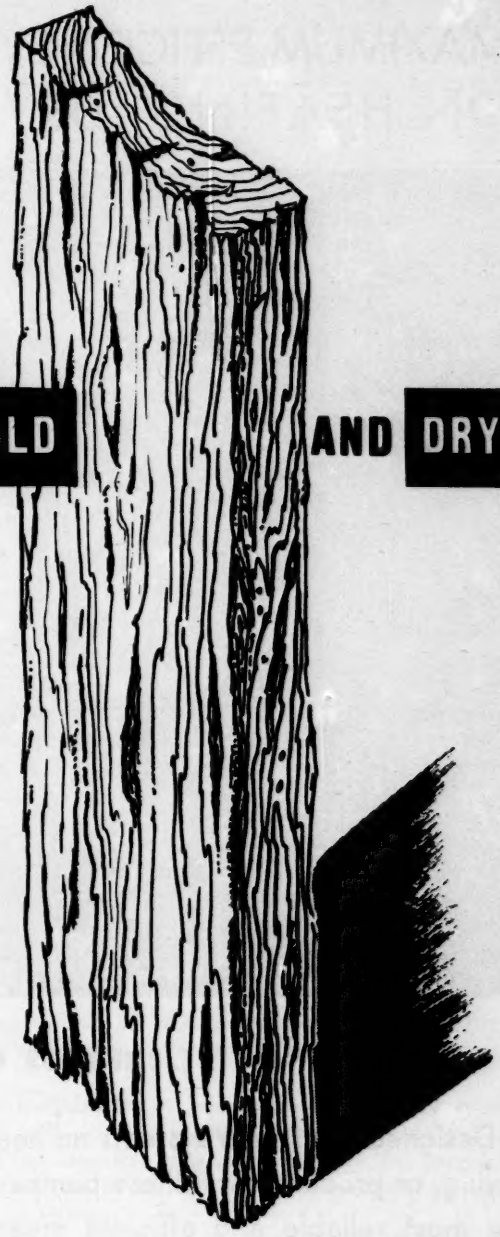
• Pittsburgh Plate Glass Co. plans to purchase a three-year old factory at Shelbyville, Indiana, as a manufacturing facility for its new Fiber Glass Division. The plant is a 147,000 sq ft, one-story structure formerly owned and operated by the National Farm Machinery Cooperative, Inc.

• Lyle C. Harvey, president of Affiliated Gas Equipment, Inc., Cleveland, Ohio, has announced the appointment of James N. Crawford to the position of assistant to the president. During the past seven years Mr. Crawford served as director of sales for Bryant Heater of Cleveland, Ohio, which is one of Affiliated Gas Equipment's three operating divisions. He is a graduate of Case Institute of Technology and has been with Bryant since 1932.

• Bryant Heater Division of Affiliated Gas Equipment, Incorporated, Cleveland, Ohio, has been elected a member of the ACRMA.

• A special short course on industrial ventilation will be held on the campus of Michigan State College, East Lansing, Michigan, February 25-28, 1952. This course, sponsored jointly by the School of Engineering, Michigan State College, and the Division of Industrial Health, Michigan Department of Health, is being offered for plant engineers, contractors, consulting engineers and all others concerned with the design of industrial exhaust systems. There will be general sessions on various aspects of industrial ventilation led by prominent field engineers. Following each general session those in attendance will divide into small groups where they will apply the principles discussed to an industrial problem.

WOOD WON'T ROT WHEN IT'S COLD AND DRY



Living fungi, which break down the substance of wood are microscopic and abundant. But they need a certain amount of WARMTH and DAMPNESS to develop. Dampness will also peel off paint, crumble plaster, rust iron and steel.

Some insulations promote and retain destructive condensation inside walls and other structural spaces. In addition to warmth, vapor of water also flows right through asphalt, paper, plaster and most building materials, including ordinary insulations. It condenses when it strikes a colder surface and reaches a dew-point.

An empty space is the best insulator against heat flow by Conduction; but does not prevent heat flow by Radiation and Convection. Of all heat transferred through structural spaces, 50% to 80% is by Radiation; all but 5% of the rest is Convection. Multiple accordion aluminum sheets throw back all but 3% of the Radiation which strikes them, and block Convection. Their insignificant mass, 1 oz. to the square foot, and their multiple air space construction, minimize Conduction.

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Simple and illuminating discussions of vapor and heat flow, including explanations of how to prevent timber rot, will be found in the just-off-the-press, completely revised, 5th edition of "Simplified Physics of Vapor and Thermal Insulation," 56 pages of facts and figures.

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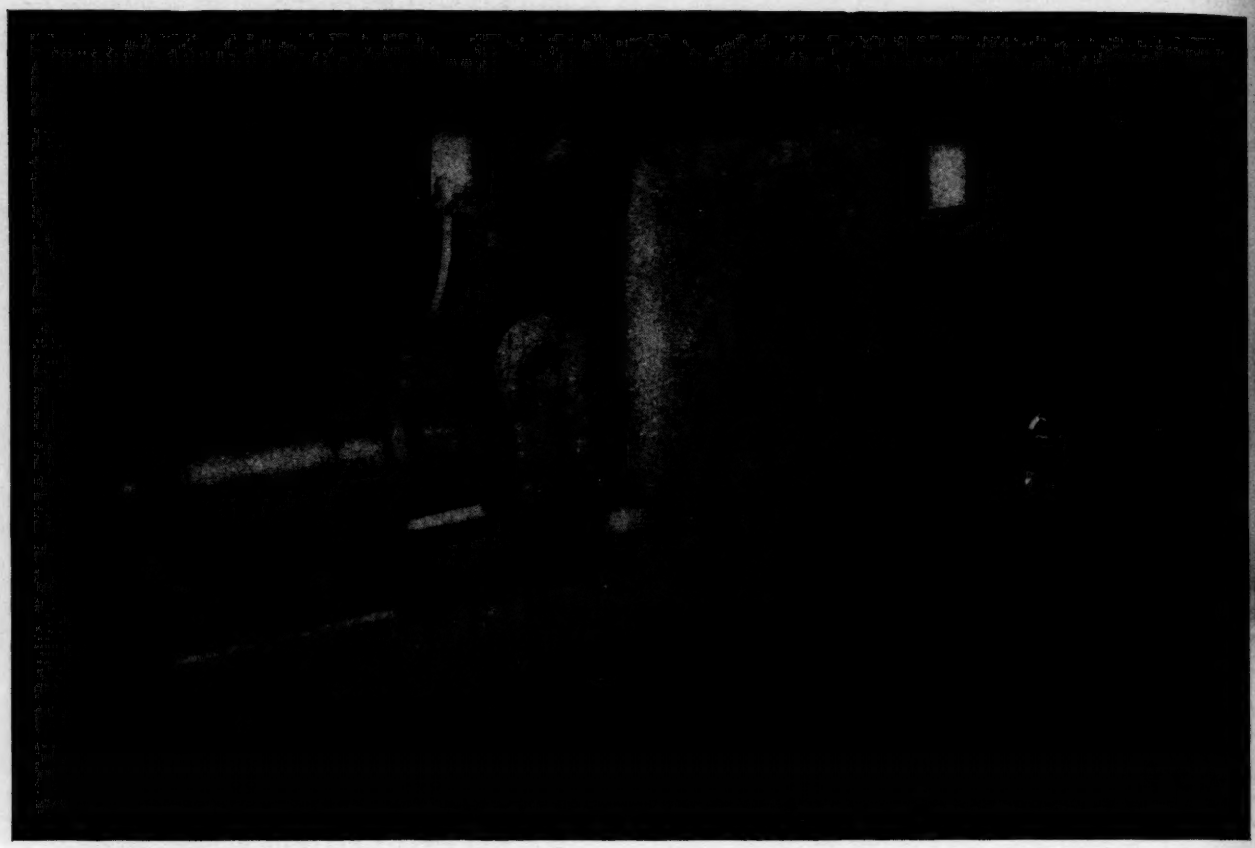

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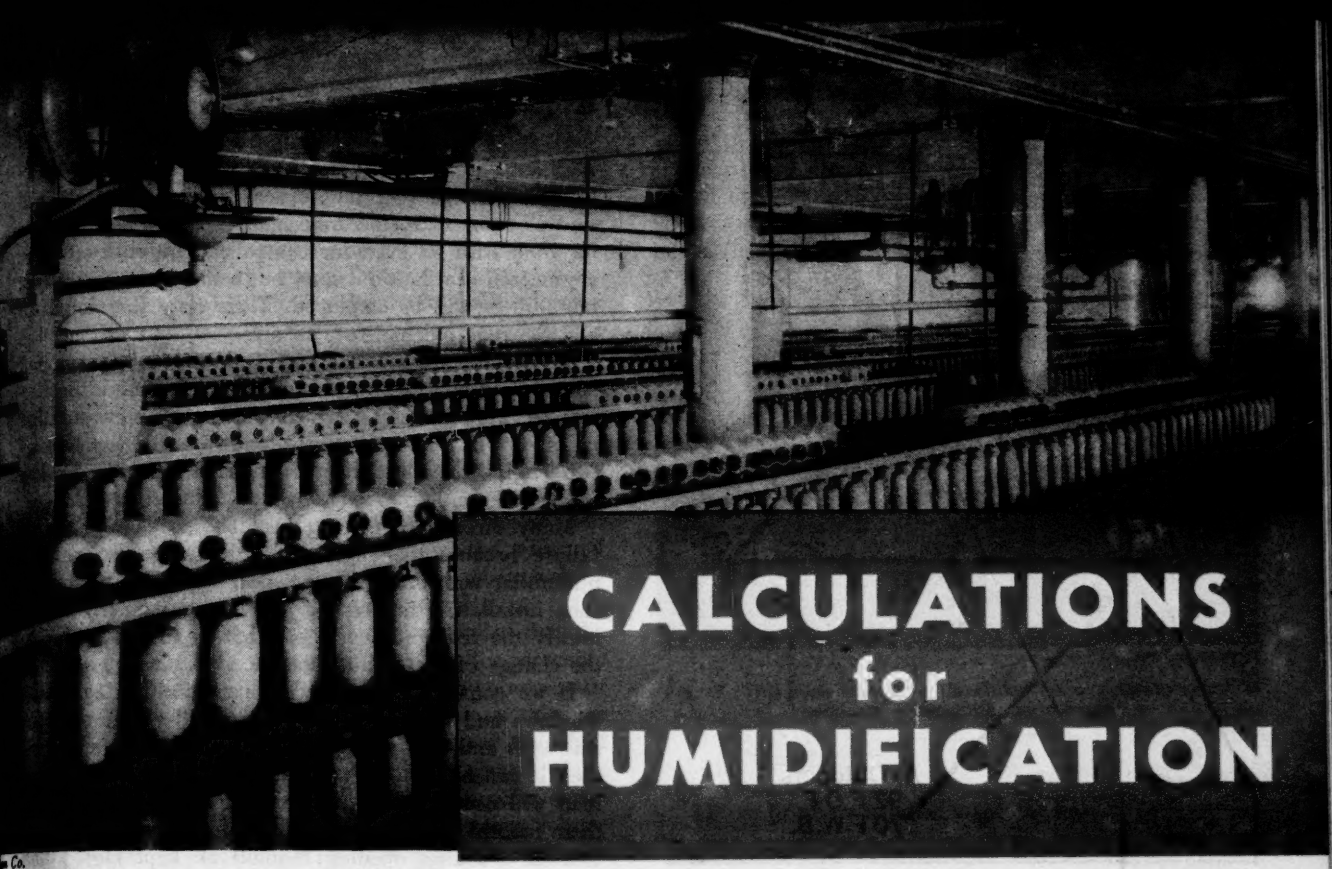


CALCULATIONS for HUMIDIFICATION

Fig. 1. Centrifugal humidifiers in a cotton spinning room. Units come in capacities up to 12 gph.

JAMES MARSHALL

Consulting Engineer, Philadelphia, Pa.

Here is an article that shows how to determine the number of humidifier units that may be necessary to maintain prescribed conditions where moisture control is necessary, and also how to place such units. It describes the various classes of direct type humidifiers that are now available. Two design problems are included.

THERE is probably less information published on the science of humidifying than for any of the other phases of air conditioning, although there is no need for this mystery. In examining this subject, it will be satisfactory to first consider the equipment that is available for adding moisture to the air.

Humidifying equipment can be divided into two classifications, (1) indirect and (2) direct. The indirect humidifiers depend on a fan to carry humidified or moisture-laden air into the space to be humidified. The humidifying element of this type system is usually an air washer providing an intimate contact between air and water. This contact is provided by water divided into fine particles or by air passing over surfaces continuously wetted. The fan and humidifying equipment are usually remote from the space to be conditioned and depend upon a distribution system. Air conditioning engineers can easily determine by calculations the amount of air required to maintain a given humidity in a space and the problem is relatively simple because there is controlled ventilation. This type system is preferred because it provides evaporative cooling and is the method of humidifying when a complete system of air conditioning is to be used.

Direct humidifiers, of which there are many types available, will do a satisfactory job of humidifying a space by breaking water up into extremely fine particles readily absorbed by the air. These humidifiers may be grouped as follows:

Compressed Air Atomizer—There are two types of compressed air atomizers now on the market—the aspirating type, and the water pressure type. In the aspirating type the compressed air siphons water from a lower level and, through the action of the compressed air, divides the water into a very fine spray. Water pressure type atomizers feed the water and compressed air under pressure. The water pressure is slightly higher than the air pressure so that as the air and water mix at the outlet of the atomizer, the water is broken into a very fine spray. Usually the water type atomizers require much less compressed air and therefore less horsepower for their operation. These atomizers are built usually in capacities of 6, 9, 12, and 15 lbs of water per hour.

Centrifugal Humidifier—This type can be uni-directional or multi-directional. Its action depends on a disc revolving at high speed. Water is fed on this disc and through centrifugal action water is spread to the outer perimeter of the disc where it is thrown against teeth and broken into a very fine spray. If the disc is horizontal, it will be located in a casing and have ports or openings

around the perimeter so that it can discharge a spray for a full 360 degrees. If the disc is mounted vertical, it will have a fan behind it to throw the spray in one direction. These humidifiers are built in capacities ranging from one to 12 gal per hour.

Steam Humidifier—This humidifier can furnish the

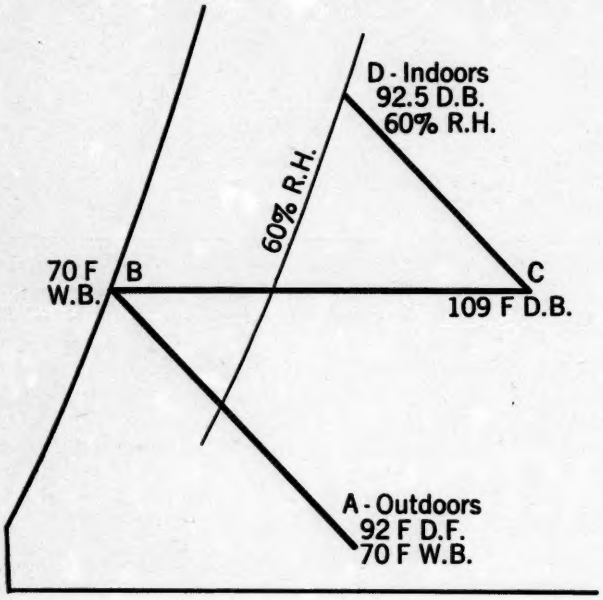


Fig. 2. Psychrometric chart for Problem 1.

vapor either wholly by (1) steam escaping into the atmosphere or (2) steam is used in the same manner as compressed air and as described under compressed air atomizers. In the latter case, the steam siphons the water to a mixing port and breaks the water into a finely divided spray.

Impact Humidifier—Action depends upon high pressure water (150 psi) impinging on the end of a small steel point. This arrangement is usually mounted with a fan in a cylindrical casing. At the bottom of the round cylinder there is a slot through which the spray can discharge through a 360 deg range. These units are built in capacities up to 12 gal per hour.

Miscellaneous Small Capacity Units—There are many types of small capacity units on the market, some functioning through mechanical separation, some by hydraulic separation, others through the action of heat, and some by impact. As a rule these humidifiers have a capacity of 1 or 2 lb water per hour and are usually used as accessories to unit air conditioners.

Direct type humidifiers have their application in plants dealing with hygroscopic materials such as are found in textile, wood working, tobacco, paper, leather, and printing industries. Hygroscopic materials change their physical characteristics with the gain or loss of moisture and, therefore, the need for controlled humidity can be readily appreciated.

A striking example occurred during World War II. Due to the shortage of metals, some airplanes and boats were to be made of wood. Since the prime contractors were usually plane or boat builders who subcontracted certain parts to various woodworking and furniture shops, it was soon found that it was necessary to have controlled humidity in all the plants so component pieces would fit into the final assembly. To accomplish these results, most of the plants were equipped with direct type humidifiers.

It is possible that the present defense program will find us short of metals and again we may have to turn to wood with its need for controlled humidities. Where engineered ventilation cannot be justified, the direct type humidifiers will be employed. Their only function is to add the required moisture to air.

It has been the writer's experience that engineers and engineering contractors who specialize in humidification will be in rather close agreement as to the evaporation required when controlled ventilation is used but that no two engineers will agree on capacities required when controlled ventilation is not used.

Many direct humidifying installations were a dismal failure because the engineering was done by persons unfamiliar with this art or science. The chief reason for such installation failure was inadequate capacity to humidify the required space and that in turn was due to the change of air within the space.

If we consider a manufacturing space having all its windows and doors tightly shut and all elevator shafts, stairwells and roof ventilators closed tightly at all times, then it can be assumed that the maximum humidifying load will occur during the cold winter months. During these months it is not too difficult to convince everyone that all building openings should be kept closed and under these conditions the humidifying capacity required can be calculated from the air changes expected. These air changes can be computed by the well known crack method or by long established rules of thumb which have been used by industrial heating engineers such as assuming that two air changes an hour will take place in a volume formed by a 30 ft wide strip around the entire perimeter of an industrial plant. When employed by experienced technical men, a rule of thumb can be more accurate than calculated methods. However, the inexperienced would do well to stick to the methods explained in text books.

After the air change has been established, the moisture deficit can be selected from any good psychrometric chart or air-vapor chart. The writer personally prefers the U. S. Department of Agriculture bulletin W.B. 235.

Calculations

A humidifying system that is selected based on such calculations will be satisfactory during the cold winter months. Many low heat gain rooms will probably be satisfactory during much of the summer when the natural outdoor humidity is very high and when windows will be opened. In most localities, it will not be satisfactory during warm spring and fall weather when the natural outdoor humidity is low and it is quite often very windy. It is under these conditions that, because of high outside temperatures and the usual high heat gains within the structure, that operators insist on opening doors, windows, roof ventilators, skylights and anything else that may make internal conditions more comfortable. The air change in that space increases immediately and the evaporative capacity is found wanting. It is during these periods that the air change within the space increases from one or two an hour up to 10 and 12 or even higher.

With conditions, as described, it becomes necessary to use a different method for calculating the requirements. The desired indoor conditions will remain the same but both the outdoor conditions and the air changes per hour will change.

In establishing the outdoor conditions, it is suggested that the engineer take the dry and wet bulb recommended by any good air conditioning data book and decrease the wet bulb 3 degrees. For example, summer design conditions for Detroit, Mich. are 95 F dry bulb and 75 F wet bulb. This has proven satisfactory, but keep in mind it is set up to establish a reasonable maximum cooling and dehumidifying load during the summer. For example, the writer has made observations in North and South Carolina which indicate that the worst humidifying conditions will occur in March, April, September and October when outdoor conditions are of the order of 96 F D.B. and 72 F W.B. as compared to recommended summer design conditions of 75 to 78 F W.B.

To set up the air changes, it is recommended that the air change selected be dependent upon the Btu per cubic foot load within the space. To find this, the volume must be determined and then the Btu heat gain within the space calculated. This heat gain should cover the effect of the sun on the roof and glass, the heat generated by motors and lights, and the heat set up by process steam and electricity. Heat gain divided by the room volume will give Btu per cubic foot. This is recommended as a criteria as it is a measure of the intensity of heat generation. This intensity is going to decide the number of windows or sawtooth glass that the personnel will open. It will set up the air changes caused by stack effect on roof ventilators, up stairwells and elevator shafts. Table 1 is an empirical one of air changes as a function of Btu per cubic foot which has proven sufficiently accurate in forecasting final temperatures that will exist in the space.

Once we have selected an anticipated "AC (air changes) per hr," we must use it and the Btu summation to forecast the temperature expected as we cannot pin down the moisture deficit until we know the outdoor and indoor conditions. This is illustrated in the following two design problems.

Design Problem 1

The following example will demonstrate steps in design. Assume the volume is 100,000 cu ft and the Btu per hour is 350,000.

Therefore, Btu per cu ft= 350,000/100,000 = 3.5

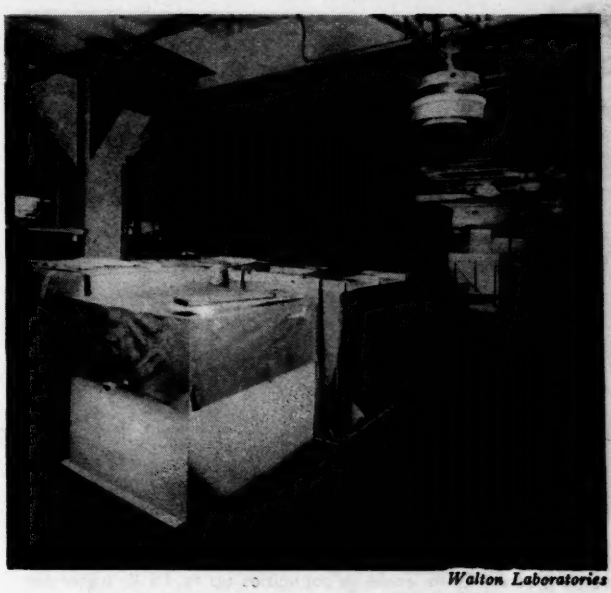
From the previous table, we find that for this value, we have 5 AC per hour. Then,

$$5 \text{ AC per hr} = \frac{100{,}000 \times 5}{60} = 8{,}350 \text{ cfm}$$

From the basic formula for heat balance

TABLE 1—AIR CHANGES PER HOUR

Btu per Cu Ft	AC per Hr
2	3
4	5
6	7
8	10
10	12



Walton Laboratories

Fig. 3. This type humidifier installed in a printing plant is available in capacities up to 3 gph.

$$\text{Lb per hr of air handled} \times \text{specific heat} = \frac{\text{Btu per hr}}{\text{temp. rise}}$$

$$\text{or } \frac{\text{cfm} \times 60}{13.3} \times 0.24 = 1.08 \text{ cfm} = \frac{\text{Btu per hr}}{\text{temp. rise}}$$

$$\text{Then, temp. rise} = \frac{\text{Btu per hr}}{1.08 \times \text{cfm}} = \frac{350{,}000}{1.08 \times 8{,}350} = 39 \text{ F}$$

In this problem, the volume of saturated air is taken at general design computation of 60 F, or 13.3 cu ft per lb of air mixture.

The next part of the problem can be plotted on the psychrometric chart, as in Fig. 2. Let us assume that the ventilation air and humidifying capacity will act as a central air washer and the outdoor air *A* (92 F D.B. and 70 F W.B.) will be saturated up the wet bulb line to point *B* where it will take a 39 F rise to point *C*. It will then be rehumidified to point *D*, 92.5 F and 60% R.H. The moisture deficit between outdoor condition *A* and indoor condition *D* will be 63 grains per pound of air (138—75).

For 8,350 cfm, this will be:

$$\frac{8{,}350 \text{ cfm} \times 60}{13.7} = 36{,}500 \text{ lb air per hour}$$

$$\frac{36{,}500 \times 63}{7{,}000 \text{ gr per lb}} = 329 \text{ lb water per hour}$$

If this job had been figured for winter conditions of two air changes per hour and for 80 F and 60% R.H., we would have had a capacity of

$$\frac{100{,}000 \times 2}{13.7} \times \frac{92}{7{,}000} = 191 \text{ lb water per hour,}$$

and therefore the unit would have been shy of capacity.

Once the capacity is decided, the engineer is then faced with the selection of equipment. In general the safest selec-

American Moistening Co.

Fig. 4. Compressed air type atomizers installed in a cotton warping room. Units come in capacities up to 15 lb water per hour.

tion for the inexperienced engineer would be the utilization of many small capacity units. This selection would add to the expense of the job, but if one is not experienced in the use of heavy duty or high capacity units, the damage that can result from their use by the inexperienced can be many times the added initial expense. To use a high capacity humidifier to its fullest extent, there are several things which must be in the engineer's favor. They are a high ceiling with no overhead obstructions, a high heat gain or Btu per cubic foot, and a low relative humidity so that the air is capable of absorbing the fine spray of water from the unit.

Location of Equipment

Because the engineer is dealing with water, even though in a finely divided spray, he must be very careful of the location and direction of the humidifying equipment. If, for example, a high capacity humidifier were selected and insufficient clearances existed around the humidifier, then as the humidifier discharged its spray, this fine water would collect on obstructions and drip to the floor, or machine, or product. High capacity unidirectional humidifiers should have a clear space in front of them of approximately 30 ft. In general these high capacity unidirectional humidifiers should have, or rather the room should have, a clear height under beam of 12.5 ft or more. High capacity impact-humidifiers will have to have approximately the same ceiling height as they are usually 3 ft or more in height and it would not be safe to use one of these high capacity humidifiers with a mounting height of less than 8 or 8.5 ft from the floor.

With ceiling heights of less than 12.5 ft, use of low capacity humidifiers should be recommended—either the centrifugal type with a capacity of 2 or 3 gal per hour with the spray discharged in a 360 deg circle, or the atomizer type which evaporates up to 15 lb per hour.

These general rules, with respect to headroom and clearances, should assist in the general selection of equipment. Once this has been decided, the capacity should be judged by the relative humidity and the heat gain existing in the room. Regardless of whether a heavy duty type humidifier is selected or a smaller capacity type, the writer has found it wise to modify the capacity based on the desired humidity and the general heat level of the room.

For example, if the desired humidity is 55% or less and if the Btu per cubic foot of the room is 8 or more, then the maximum capacity humidifier could be safely applied. This would mean that if we decided on heavy duty type humidifiers, we can take a unit which has a capacity up to 12 gal per hour or if we decided on a small capacity humidifier, we can take one which has a capacity of 2 or 3 gal per hour or 15 lb per hour, whichever happens to be the maximum capacity of the particular humidifier selected. Now as the Btu per cubic foot decreases, then the capacity should be modified downward. Also as the desired relative humidity increases, the capacity of the humidifier should be decreased downward. We would then find that for say 2 or 3 Btu per cubic foot and with a desired 80% to 90% relative humidity, we would then select the smallest type of humidifier built in the particular range.

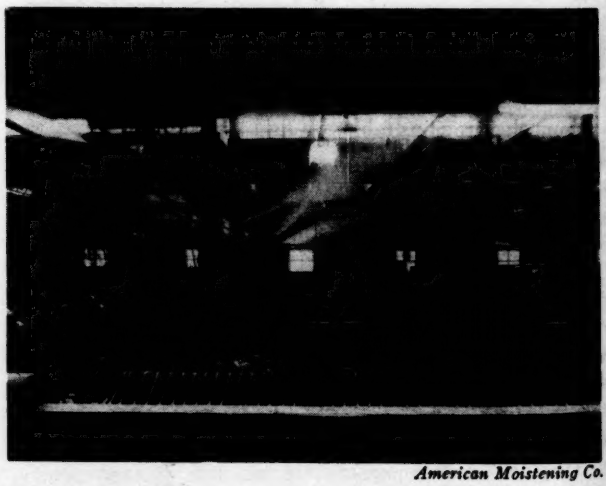
Size of Units

Following is a recommended table of factors to be applied to the maximum capacity of any unit direct type humidifier.

TABLE 2—RECOMMENDED FACTORS FOR DIRECT TYPE HUMIDIFIER

Btu per CF	Factor	R.H.	Factor
10	1.0	up to 55	1.0
8	0.9	55 to 65	0.9
6	0.8	65 to 75	0.8
4	0.7	75 to 85	0.7
2	0.6	85 to 95	0.6

To illustrate the use of Table 2, let us take the case of a room which has 6 Btu per cubic foot and a desired 70% R.H. If we have already decided the ceiling heights and clearances were such that we should use atomizer type humidifiers and we know that the maximum capacity made for this type unit is 15 lb per hour, then we should multiply 15 lb per hour x 0.8 and multiply this product by 0.8 again. This gives us 9.6 lb per hour. It



American Moistening Co.

Fig. 5. Installation in a cotton card room using compressed air atomizers.

defines the atomizer capacity that should be used in that application. It would be the writer's recommendation that 9 lb humidifiers be used.

Once the type and capacity of the units have been settled, it is a simple matter of selecting the number required and locating the humidifiers about the space. If we know that the total requirements as shown in the example, is 329 lb water per hour and if we know that we should use 9 lb units, the slide rule shows us that we will require 36.4 atomizers. Therefore, we will use a layout of 37 atomizers uniformly distributed about the space.

In laying out the location of the humidifiers, proper consideration should be given to the machinery concentration and the critical areas. For example: if 50% of the machinery is located in 25% of the room then approximately 50% of the humidifying equipment should be located in that portion also. If one particular area is more critical with respect to its humidity demands than another, then this area should be given more consideration than any of the others. There is not much that can be said on this subject to guide the engineer in making his layout but he should carefully consider the machinery concentration and the location at which the ventilation or air changes per hour will be the greatest. If the machinery, which is generating the heat is uniformly distributed throughout the space, then it will be found that the humidifiers should be uniformly distributed throughout the space.

Design Problem 2

Consider a mill 200 ft long by 100 ft wide with an average ceiling height of 15 ft located in Louisville, Ky. It could be a furniture plant, a textile mill, a tobacco factory or a leather mill. The mill has sidewall windows and a roof monitor. Within this space there is 100 hp input in production machinery, 30 kw of lighting, two 5 hp exhaust blowers each rated at 5,000 cfm. The operators desire to humidify this mill to 60% R.H. the year-round.

From a reliable source we find that the recommended dry and wet bulbs for summer air conditioning in Louisville are, respectively, 95 F and 78 F. We would be safe in adjusting this to 95 F D.B. and 75 F W.B. for our humidifying calculations. This is plotted as *A* in Fig. 6. We also learn from the same source that the accepted design dry bulb for winter heating in Louisville is 0 F. We are given the following basic design data:

Volume: 200 x 100 x 15 = 300,000 cf.

Btu gain from sun shining on roof	160,000
Btu gain from sun shining on wall and monitor glass	300,000
Btu from lights	101,000
Btu from machinery horsepower	254,500
Btu from exhaust fan motors (10%)	2,545
Total Btu per hr	818,045

$$\text{Btu per cf} = \frac{810{,}045}{300{,}000} = 2.7$$

From Table 1, we find for 2.7 Btu per cu ft, 4 AC per hr.

$$\text{4 AC per hr} = \frac{300{,}000 \times 4}{60} = 20{,}000 \text{ cfm}$$

$$\text{Temp. rise} = \frac{818{,}045}{20{,}000 \times 1.08} = 37.8 \text{ F.}$$

On the psychrometric chart, Fig. 6, we move along the 75 W.B. line to *B*. Adding the 37.8 F temperature rise,

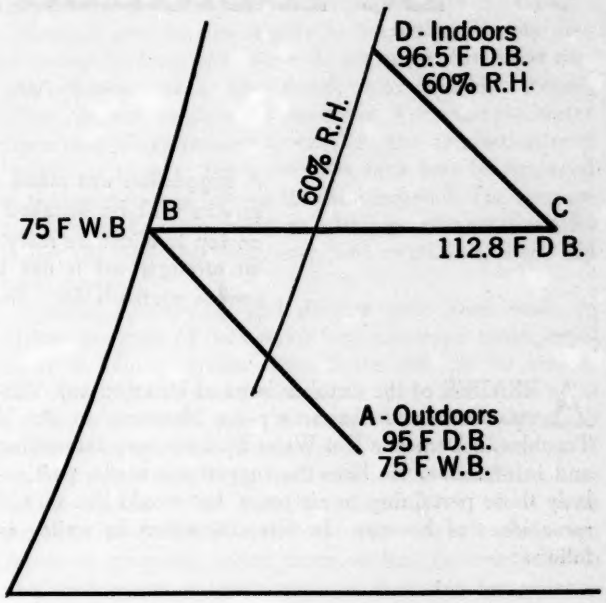


Fig. 6. Psychrometric chart for Problem 2.

we find *C*. From that point we move along *CD* to *D* (where it crosses the 60% R.H. line). From this we find the dry bulb is 96.5 F.

Grains moisture per lb at 96.5 F D.B. and 60% R.H. = 158

Grains moisture per lb at 95 F D.B. and 75 F W.B. = 98

— gr per lb deficit 60

$$\frac{20{,}000 \text{ cfm} \times 60}{14 \text{ cf/lb}} \times \frac{60}{7{,}000} = 735 \text{ lb water per hr}$$

This capacity should be checked against the winter requirements created by the 10,000 cfm exhaust air assuming the indoor temp. will be kept at 80 F.

From U. S. Dept. of Agriculture Bulletin W.B. 235
Grains per cu ft at 80 F and 60% R.H. = 6.56
Grains per cu ft at 0 F and 30% R.H. = .144

6.416 deficit

$$\frac{10{,}000 \text{ cfm} \times 6.416 \times 60}{7{,}000} \text{ min/hr} = 550 \text{ lb per hr}$$

We find therefore that 735 lb will do the job the year-round.

The ceiling height would permit us to use either high duty centrifugal or impact humidifiers or compressed air atomizers. Since the Btu per cubic foot is 2.7, we apply a factor (Table 2) of 0.6 and since the R.H. is 60% we apply a factor of 0.9. The combined factor would be 0.54. Therefore if the maximum capacity high duty humidifier is 12 gal an hour or the maximum capacity of a compressed air atomizer is 15 lb per hour they should be selected for 6½ gal per hour or 8 lb per hour, respectively.

Should a Hot Water Service Tank Be Installed Upside Down?

T. W. REYNOLDS

A suggestion was made by a reader that the hot water service tank be installed reversed with the concave end on top to eliminate rusty water. Author explains why such an arrangement is not considered satisfactory and describes methods for eliminating red water.

A READER of the October issue of HEATING AND VENTILATING finds the article on Measures to Avoid Troubles in Domestic Hot Water Systems very interesting and informative. He likes the suggestions made, particularly those pertaining to air traps, but would like to add some ideas of his own. In this connection he writes as follows:

Installation Suggested by Correspondent

"I am only an amateur in this field, but have had a moderate amount of experience with such systems in several small residences in which I once lived, together with one in a large residence which I recently converted to an apartment house for four families.

"Based on experiences and corrective experiments made therein, I would turn the hot water tank of Fig. 1 (illustration of the installation described in the October, 1951 article) upside down as shown in Fig. 2. The cold water would then be introduced into the tank through its normal lower side opening by means of a ½ inch diffusion pipe 12 inches long, inserting this pipe through a range union.

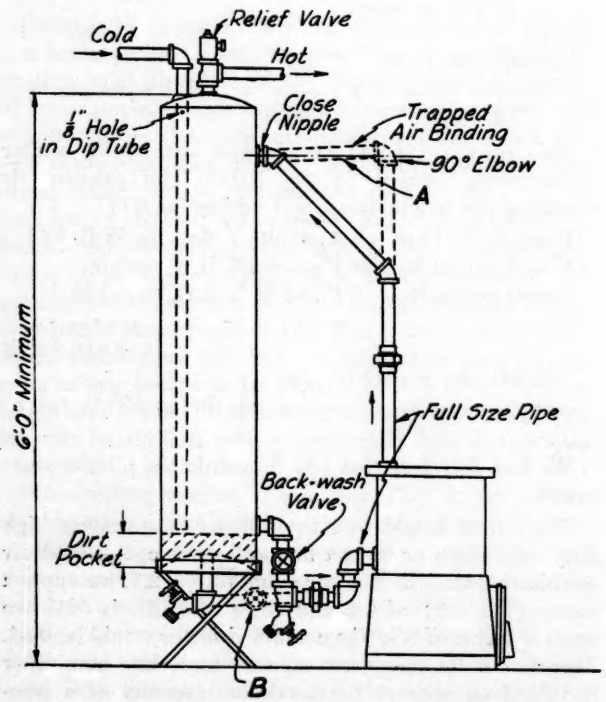


Fig. 1. Tank with dirt pocket. This is the installation to which a reader objects.

"It is an easy matter to tap the range union to receive the diffusion pipe. The opposite end of this pipe should be plugged or capped. It seems that the kinetic energy of the incoming water is dissipated by distribution through two rows of holes drilled along the pipe. These holes should be directed with about a 60 deg. angle between the planes in which lie the centers of the holes.

"The flushing outlet should be at the lowest part of the tank, so that very little or no rust and foreign material remain after flushing. The conventional method of mounting, Fig. 1, leaves the rim around the concave end at the bottom full of rust. Since this rust is in contact with the tank it accelerates corrosion by galvanic action.

"One hot water tank installed with the concave end down, Fig. 1, still had rust remaining around the rim notwithstanding regular flushing for several years. Rusty water was discharged from this tank each time hot water was rapidly withdrawn at the taps. So I finally disconnected the tank, turned it over and washed it out with a hose, then replaced it with a 50 gal. tank, convex end down, Fig. 2. With circulating return and flushing drain both at its bottom, there is no longer any trouble at taps because of rusty water, that is, providing a pail of rusty water is withdrawn once a month from the drain outlet.

"Most of the rust flushed out from domestic hot water systems is from a film inside the heat exchanger coil or the deposit in the settling stub of the circulating return line. It would seem objectionable to allow rust to accumulate in the tank itself. The tank should be flushed out at regular intervals, say at least once a month."

Reply to the Suggestion

The ideas expressed by the correspondent are new and novel to many users of hot water, but not to the experienced trouble finder in domestic hot water systems. His thinking, while commendable, is based on a relatively limited amount of research and troubles. While the installation worked for him under the given conditions, when others apply the plan they may run into additional

field factors, especially so when they add further ideas of their own, which is the usual thing. There are better ways of eliminating rust and corrosion. More will be said about this later.

The reader is engaged in laboratory research on devices foreign to hot water. As a consequence, he has overlooked the fact that in a laboratory experiment all conditions are carefully made alike except the change to be tested. Invariably, this is forgotten in the field and so one or more of the conditions which should remain fixed are usually changed. For example, although the correspondent turned his tank upside down, he at the same time increased its size. Increased capacity means less need for overheating the water to the critical temperature where rusting becomes most active. Furthermore, the hotter the water, the more solids are precipitated out of the water. This is the reason for locating mixing valves below the source of hot water. Tanks arranged as shown in Fig. 1 do not provide rusty water unless they are of inadequate capacity, overfired and irregularly flushed.

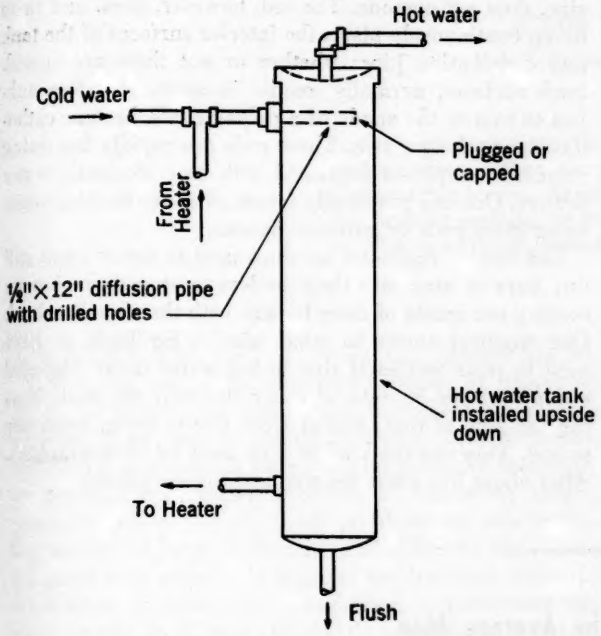


Fig. 2. Tank installed reversed to eliminate the dirt pocket around rim.

A certain amount of rusting continues in a hot water tank by arrangement of either Fig. 1 or 2. Fresh water containing oxygen is always entering the tank. Rust however, may be discharged continuously with water drawn at taps although in unnoticeable amounts. Again, it may be stored in part within the tank and never stirred up under usual conditions.

Galvanic Corrosion

A rusty area can form a galvanic cell with some less rusty area, thereby increasing the amount of rust. However, rust accumulated to the extent described by the correspondent may shield or protect the underlying areas from attacks by corrosive agents. Tubercles and pits become sealed off to stop further corrosion.

One who has seen the inside of worn out range boilers knows that the pock marks and corrosion craters do not occur only where the rust settles. In some places there are mounds 3 to 4 inches thick, although on the average they are 1½ to two inches thick. One gets the impression that molten lava may have been poured into the tank.

Rusting goes on due largely to overfiring. It may also be caused by local galvanic cells set up by dissimilar surface conditions of the tank metal, or by dissimilar metals, if any, in trim or piping connections. For example, water pipes may be galvanized or copper; gas connection may be steel or copper; zinc coating of tank may be damaged at threaded outlets leaving the iron exposed. The thermostat (if any), drain valve and unions will no doubt be brass; the clean out plug, cast iron or steel; and the dip tube, copper.

Numerous attempts and devices have been made to diffuse the rush of cold water into hot water tanks, especially in high pressure areas. Some enlarge the size of the inlet pipe to tank, others use dip tubes with holes drilled to spray the entering water. It is a good approach and may or may not be successful, but the slowing up of the jet action of entering water is not for the elimination of rusty water as the correspondent believes. It is more for the elimination of short cold water circuits and, even more, to maintain water more or less dormant and in stratified layers of temperature so that only hot water is delivered from the top of the tank.

Flow Control Valve

Actually, the place to mix or rather temper hot water with cold water is at the faucet, not in the tank. One can even install a flow control valve on the cold water pipe before it enters the tank. Such a valve, Fig. 3, will improve most any installation and will effect fuel savings at a cost to the contractor of about $1.75. If 6 gpm are drawn through a heater having a capacity of 4 gpm, then the 2 gpm over capacity causes the entire gallonage to be too cool. However, this valve will limit flow to a predetermined amount. Obviously, such a valve is of particular advantage with tankless heaters to prevent overdrawal and consequent discharge of cool water.

In general, flow control valves are accurate within 5 to 8% over and under the mean capacity when used within a pressure range of 15 to 125 psi. Beyond this range, accuracy is impaired. Water temperatures in excess of 200F should be avoided. Valves are obtainable in ½ and ¾ inch sizes and in capacities from ½ to 10 gpm. The valve can be installed as easily as an ordinary coupling.

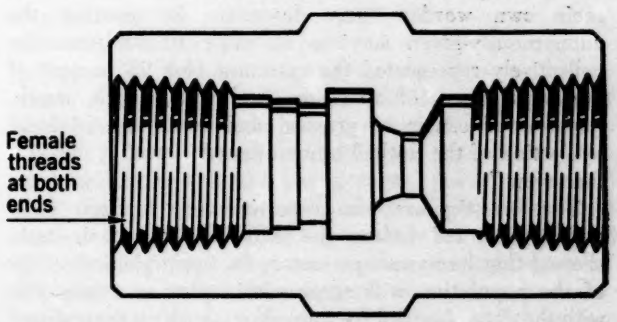


Fig. 3. Special valve to keep flow within heater capacity.

For tankless heaters it should be installed at or near the cold water inlet to the heater. The valve, which is of brass, has a specially designed rubber orifice that varies its size uniformly and inversely in proportion to the pressure. Lime or other deposits do not clog the orifice because the orifice is self-cleaning.

Four Ways to Prevent Corrosion

Corrosion in a hot water tank can be prevented or reduced to a reasonable minimum by (1) installing a copper, monel or glass lined tank—the kind of tanks not seen on junk piles, (2) treating the water chemically, (3) installing a replaceable magnesium or zinc rod in the tank, or (4) maintaining water temperatures well below 155F.

Higher temperatures also cause undue expansion and contraction which in turn start leaks at joints and dislodge rust particles which may cause stoppages or reduced flow of water. Unfortunately, high temperatures are sometimes required to overcome the effect of large withdrawals to get rid of rusty water. They are also required to overcome poor circulation caused by air pockets, sediment, long runs of piping, inadequate pipe sizes and defective check valves. Removal of the flaps of a check valve to help circulation will often hinder circulation by allowing reversed flow. Circulators are of help in equalizing temperatures throughout. Wherever possible, flushing should be counter to normal flow.

Underheating of water introduces more water and therefore more deposits. With underheated water, more water is drawn at the faucet in the hope that hot water will eventually flow.

The tank with a sacrificial rod, such as magnesium or zinc, does not corrode. The rod, however, does, and in so doing continuously plates the interior surfaces of the tank and distributing pipes whether or not these are rusted. Such surfaces, normally anodic in spots, therefore subject to rust as the anode of a galvanic cell, become cathodic and no longer rust. These rods are rapidly becoming standard equipment furnished with most domestic water heaters. One can practically forget all about flushing when using these rods or galvanic anodes.

Old marine engineers on ships used to throw (and still do) bars of zinc into their boilers to stop corrosion by coating the inside of their boilers with the zinc dissolved. One engineer comes to mind who as far back as 1924 used to pour feathered zinc in hot water tanks. He used one pound per 20 gals. of water stored in the tank, buying the zinc at that time at from five to seven cents per pound. This was the kind of zinc used by photographers. After about five years the zinc had to be replaced.

Shape Factors for the Average Man

Heating, ventilating and air conditioning engineers who have tried for years to evaluate the effect that variation in the shape of the human body has on energy received from heated or cooled wall, floor and ceiling areas, have found the complex curves and projections of the human body a technical obstacle that seems to be insurmountable.

However, it now appears from experiments conducted by two professors of mechanical engineering that the human shape factor, as it is called, of say a shapely show girl, and the average person, is practically the same. In their tests, F. W. Hutchinson, professor of mechanical engineering, University of California, and Merl Baker, assistant professor of mechanical engineering, University of Kentucky, used a clothed 5 ft, 11-inch dummy weighing 165 pounds to determine the shape factor of the average man.

To check on the applicability of average man factors, to markedly non-average individuals, the engineers, in their own words, "were fortunate in securing the anonymously-given services of some 10 subjects who collectively represented the extremes (for 95 percent of the population) of variation in height, width, depth, position of center of gravity, and maximum of local projection of the clothed human figure in profile and full-face view."

The investigators who reported their findings in a paper presented before the ASHVE, said their tests showed that human shape factors for approximately 95% of the population will agree within plus or minus 7% with the data obtained from the dummy which represented the average man. For the majority of people, (say 75%, agreement between actual and dummy shape factors will be found to be extremely close.

The investigation reported was intended to provide accurate experimentally determined shape factors for an average person with respect to energy emitted by areas in the floor at varying distances from the point at which the subject is standing. On the assumption as proved valid by previous tests that shape factors for the front view can be accurately taken as equivalent to factors for the back view of the standing figure, they tested only for full-face and semi-profile values.

In earlier tests, similar shape factors were reported for the human body (in standing and sitting position) with respect to energy emitted by wall and ceiling areas.

Since the shape factors of all but one of the boundary subjects were within plus or minus 4% agreement with the shape factor of the average subject (for floor areas more than 5½ ft out from the position of the standing subject) it appears that the shape factors can be used with acceptable accuracy for any person whose figure is close enough to the accepted norm to permit escaping marked public attention, said the engineers.

"For an occupant remaining in a fixed position, as in some kinds of factory work, it is evident that maximum effectiveness of local heating, or cooling, would be attained by providing a heated ring of floor surface having an inside diameter of approximately 3½ ft and an outside diameter of 4½ ft; the average direct radiant transfer from this ring to the occupant would be of the order of 7%, hence per unit area, the ring would be some 700 to 1,000% more effective than uniform heating of the entire floor area," the authors said.

Warm Air Heating with Diffuser Outlets

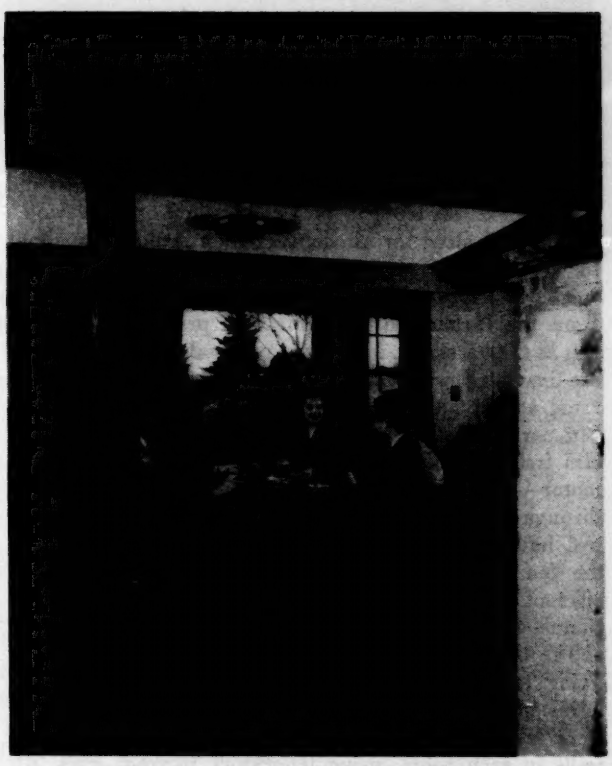
JOHN J. ALBERT
Hobart Thomas Co., Bethel, Conn.

In the past twelve months a number of forced warm air systems using ceiling air diffusers have been installed in Connecticut homes. Results point to a bright future for this heating method. In the author's opinion, it has much to offer in comfort, cleanliness and economy.

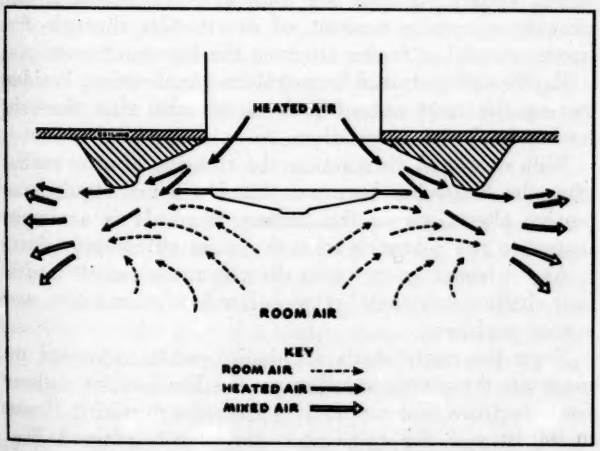
WHILE THE USE of ceiling air diffusers has become one of the standard methods of delivering air in industrial and commercial buildings where large volumes of air must be moved, balanced, and distributed, residential applications have been inhibited by seemingly uneconomic engineering problems of mounting height, pressures, velocities, etc. Such problems are inherent in the nature of large buildings, and diffusers have been designed with adjustable features for handling them. In residences, however, air distribution requirements are more nearly fixed and are greatly simplified. Hence, it has been possible to design a diffuser for homes which is of much simpler construction and lower cost while retaining the basic advantages of draftless delivery and high entrainment ratios. In one-story-and-attic houses, an overhead system with diffusers designed for residences costs a little less to install than a conventional forced warm air system and gives the owner a heating plant that performs outstandingly with respect to comfort, cleanliness and economy.

Residential ceiling diffusers were used for the first time by the author's company in a Danbury, Conn., home located on a ridge at about 800 ft elevation. The house is a full basement, full expansion attic, frame dwelling of standard design. Wall construction consists of wood siding, paper, sheathing, rock lath and plaster with paper backed aluminum foil insulation between the studs. Ceiling is rock lath and plaster with the same type of insulation. Windows are of the wood casement type generally used in this area. Approximately 25% of the exposed wall surface is windows and doors. All exterior doors have the interlocking type of weatherstripping. Flooring is oak throughout with wall to wall carpeting and undercarpet in the living room, dining room and hall. Rubber tile flooring is used in the kitchen and bathrooms. Only good building practice has been followed in providing draft stop construction throughout, using top plates over interior partitions, etc.

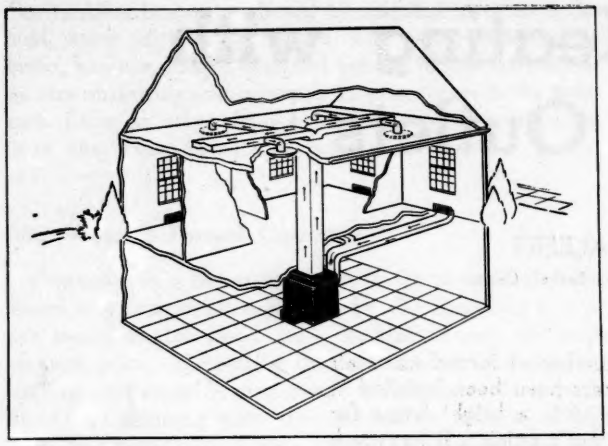
Prevailing wind is from the northwest and there is a breeze, ranging from gentle to medium velocities, about



Residential type ceiling air diffuser in a dining alcove.



Cross section of the diffuser.



Schematic cutaway of typical installation.

300 days of the year. Heat loss is calculated at 92,000 Btu per hr based on casement type windows and two large double-hung windows. In addition, the furnace was sized to accommodate two attic bedrooms and a large recreation room in the cellar which were planned for the future.

Nine diffusers were used, two in the living room and one each in the dining room, kitchen, bedrooms and baths. Each was sized to fit a round duct opening which was in turn sized for air delivery by a standard method[1] for forced warm air systems.

The 24 by 24 inch heater bonnet goes upward directly from the furnace to the attic with practically no heat loss in the basement. Main attic supply ducts and branches are insulated with balsam wood batts. The furnace is rated at 141,000 Btu per hr at the bonnet and 120,000 Btu per hr at the outlets. The blower is rated at 1800 cfm free air delivery—12 inch size with ¼ horsepower motor—and delivers about 50% of free air rating through the nine outlets. The fan and furnace limit control have always been set as the factory recommends, the fan to cut in at 90F and out at 80F. The most efficient pulley setting of the fan was found to be at 90%. Bonnet temperature is 150F to 160F.

The thermostat is in the dining room, just inside the living room archway, five feet above the floor, and is adjusted to within ½ degree cut-in and cut-out. Readings were taken periodically at five foot heights on interior walls in each room, using laboratory thermometers. All were within a half degree of the 72F thermostat setting. A few check tests at the ceiling line showed readings of 73F. There is little chance of stratification with overhead diffuser discharge, especially with the relatively low ceiling heights of modern construction.

The vital feature of this system is the diffuser. The warm air is not dumped vertically into the rooms but is deflected horizontally outward in a circular pattern well above the heads of the occupants. Although the velocity of the supply air is relatively low it still has enough force to create a gentle and unnoticeable movement of all the air in the space. This distributes the heat evenly and thoroughly and without drafts to every corner of the house. The actual mixing of supply and room air takes place within a foot or two of the diffuser at a ratio of 4.5 parts of entrained room air to 1 part of supply air.

The ceiling air diffuser consists essentially of a neck or collar and an inner and outer cone with the air passageway between. The inner cone is so positioned as to discharge the supply air at the proper angle away from the ceiling. The unit extends about two inches below the ceiling and the outer cone has a built-in shoulder which further deflects the air stream away from the adjacent ceiling area. Besides aiding mixing of supply and room air, this design is intended to prevent any possibility of smudging or streaking, formerly a chief objection to ceiling outlets. The ceilings in the Danbury house are as clean today as when plastering was completed. Overhead diffusion has another advantage and one that should appeal strongly to the housewife. There are no air currents or eddies to deposit dirt on walls, curtains or drapes. It was found that a certain amount of dust did settle on the shoulder of the diffuser but no more than to require wiping with a damp cloth twice each winter.

Five 30-by-4-inch return air grilles were used, one in the living room, one in the dining room and one each in the three bedrooms to provide about 75% return. Location of return grilles directly under windows has been very successful in taking advantage of the natural flow of air and adding to the normal diffusion process. The grilles serve to channel off the cold air as it falls down the windows with the result that a warmer air curtain is drawn down over the surface. In addition, return grilles exert a slight syphoning action at floor level, drawing in the colder floor air from a distance of several feet. Temperatures at all return grilles were 70.5F.

Fuel consumption was very favorable, although figures are not at hand on other types of warm air systems in identical dwellings. Between October 27, 1950, and April 25, 1951, a total of 1378 gallons of oil were used, at cost of $179.14 for the 25½ week period. But plaster was not dry until December 4th, return air ducts not connected and attic not insulated until February 1st. Estimate for 1951-52 is $157.30, a very moderate figure for a house of 1800 square feet in this part of Connecticut.

Another feature from the owner's standpoint is the freedom in furniture arrangement. Because there are no wall or floor units to be allowed for, furniture can be moved around at will.

If at some future date, it is decided to install a cooling unit, the ideal air distribution design already exists. Then again, simply running the blower in the summer will provide a certain amount of air motion through the house, supplying cooler air from the basement area.

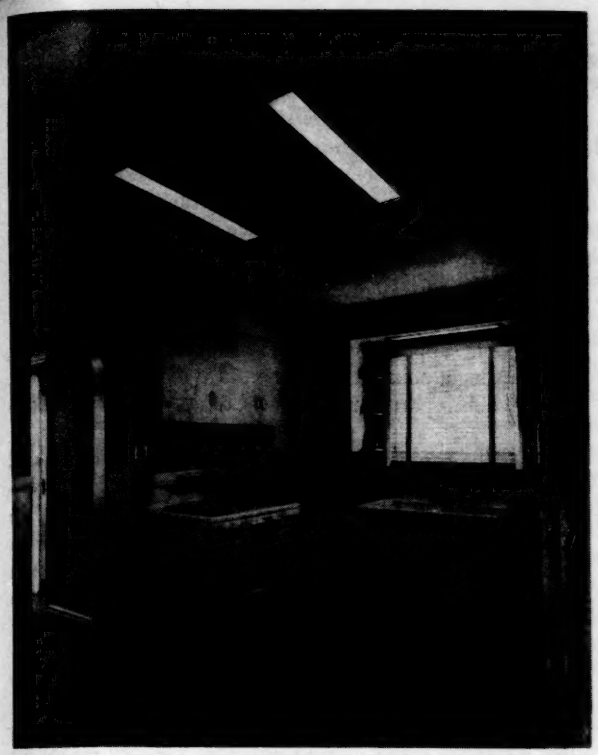
Rapid and sustained temperature equalization, besides getting the most out of fuel, means also that there is no lag in furnace operation.

With overhead distribution, the addition of attic rooms after the house has been completed will not require extensive alterations in the heating plant. It is a simple matter to run a branch from the main attic supply duct.

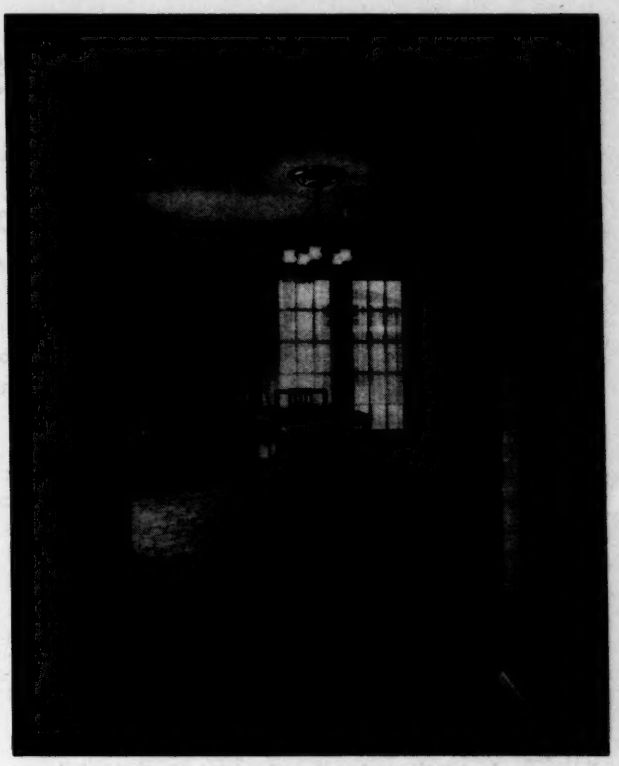
As the heater bonnet goes directly up to the attic with only shallow, horizontal returns, low headroom basements are no problem.

From the contractor's standpoint, what impressed us most was the simple installation. The Btu loss for a given room requires heat supplied by a certain duct size. Hence an outlet with the same neck diameter is selected. Prefabricated round ducts and elbows are used for the in-

[1]The author's company uses the so-called inches of heat method, but any standard method of sizing round ducts will be effective in properly sizing diffuser outlets.



Kitchen of the Danbury house with standard commercial diffuser.



Dining room of The Danbury house with special, plated, diffuser-light-fixture combination.

sulated attic run-outs as they are not conspicuous. And there is never any question as to where to locate the diffusers. The diffusers are always centered in most of the rooms and are on quarter centers in large oblong spaces such as living rooms.

An overhead distribution system is, of course, easier to install in one-story and attic dwellings. In two-story houses getting the ductwork in between ceiling and first floor is not as simple. However, in remodelled houses we have found it an ideal method of heating the second floor.

On our first job we used a standard commercial diffuser made by the W. B. Conner Engineering Corp. of Danbury. Since then we have installed a number of others using the simpler and lower priced diffuser designed specifically for homes by this company.

World's First Peat Gas Turbine

From England comes notice that the first peat-burning gas turbine in the world is now running in the engineering shops of John Brown and Company, the famous Clydeside shipbuilders.

The plant consists of the firm's 500 hp experimental gas turbine which was first run four years ago on oil and is now equipped with a peat-burning air heater and peat-drying and grinding equipment. The peat-burning part, also manufactured by John Brown, will, it is hoped, prove the first stage in the development of a commercial plant for the production of electricity.

The present plant is to undergo a series of tests in order to determine the suitability of a peat-fired closed cycle gas turbine for continuous operation to produce electric power. In its present form it can run on peat of any moisture content up to 50%, but next year the firm will construct further drying equipment to enable the plant to take peat of a higher moisture content without loss of efficiency. The project was initiated by the Scottish Peat Committee, appointed in 1949 by the Secretary of State for Scotland.

Another type of plant, an open cycle gas turbine burning peat, is being built by Ruston and Hornsby of Lincoln, under contract to the Ministry of Fuel and Power. In addition, the Scottish Hydro-Electric Board is buying from John Brown a closed cycle gas turbine of 12,500 kw capacity to be installed in Dundee, using oil as a fuel. This will be the first commercial closed cycle gas turbine to be installed in Scotland.

Before it can be decided whether a peat-fired gas turbine can produce electric power economically on a large scale, it will be necessary to test thoroughly the reliability and performance of the plant and to devise effective and economic means of producing peat fuel. The Scottish Peat Committee are at present investigating a process of removing water by pressure to see if it offers an efficient means of producing a fuel of reasonably low moisture content all the year round. Another scheme to be tried out aims to win peat by the milling method. This involves skimming off the surface of a peat bog and then running machines over it to tear the thin layers of peat off.

The technique of burning dried peat in the experimental gas turbine is closely related to the burning of coal in the same way. If and when coal also can be burned in this way on a commercial scale, substantial economies will be realized in the use of lower-grade coal to produce power.

Atmospheric Sanitation

In Los Angeles County

FLOYD H. VIETS

Consulting Engineer, Air Pollution Control District,
Los Angeles County, California

A case study of the air polution problem and its solution from the stand point of legislation, meteorology, and engineering in various industries.

SOUTHERN California had just cause for promoting anti-smoke legislation which may have seemed drastic and even unreasonable to some. Southern California has been a land of sunshine, bounteous living and a beautiful land of vacation and tourist attractions. This was changed with the industrialization of Southern California. With industry came the pollution of the atmosphere and there was found a name for it which combines the effect of smoke, fumes, dust and dampness, and the term smog was coined.

There are three obvious effects of smog. One is the reduction of visibility. Another is the irritating effect on eyes and throats. The third is the effect on vegetation and garden crops, such as spinach, chard and romaine, to the extent that thousands of dollars worth of crops have been lost annually in the Los Angeles County area. A fourth, less obvious, and still unevaluated effect is on the health of individuals, particularly the very young, the very old, and the infirm.

A peculiar combination of topographical and meteorological conditions characteristic of Southern California, permits a building up of pollutants in the atmosphere to an unusual degree. Los Angeles and its environs lie in a basin formed by a mountain chain somewhat in the shape of a horseshoe, bounded on the open side by the Pacific Ocean. Under certain weather conditions, and at certain seasons of the year, this basin is overlaid by a layer of warm air which prevents the escape of pollutants, or a change of atmosphere in the basin, because the basin air does not rise into the warm layer or inversion above. During these particular weather conditions, wind velocities are very low. The drift during the day is from the sea to the mountains. The distance is perhaps 30 to 40 miles. Then, changing with the sunset, the breeze blows toward the sea. If the warm air ceiling is low, holding the pollution down to a stratum of perhaps 500 to 1,000 ft thick, and persists for several days the intensity or density of the smog layer becomes very great.

There is very little clarification due to settling because the particles contained in the smog are very minute.

All of these conditions combined to cause the State Legislature to attack the problem, and out of their study and work came the present amendment of the Health and Safety Code enacted in 1947. It empowers any county in the State of California, which finds itself beset by a smog condition, to organize an air pollution control district. It provides means of implementing such a district with a director and an organization under that director, with an independent appeal board consisting of three members, and with legal counsel from the office of County Counsel. All of whom operate under the County Board of Supervisors.

Under the provisions of the state law, the county board of supervisors has the power to enact certain other rules and regulations which will supplement and broaden the state act and which will, within certain limitations, govern individual cases which may be borderline cases or which may not come under the general act of the state. Such rules and regulations have been enacted in a number of cases.

One of the first such rules to be placed upon the books is the dust and fume regulation, known as Rule 54. A study was made of a number of industries which were polluting the atmosphere with large quantities of dust and fumes. Particle sizes and amounts were studied. Corrective means were considered, and a tabulation was worked out based on known workable corrective equipment which could be installed and which was available.

The basic principle of the rule lies in the fact that the loss to be allowed bears a certain relationship to the weight of material processed per unit of time.

A table is included in Rule 54 which gives the process weight and the corresponding allowable loss. The rule defines process weight as follows:

> Process Weight is the total weight of all materials introduced into any specific process which process may cause any discharge into the atmosphere. Solid fuels charged will be considered as part of the process weight, but liquid and gaseous fuels and combustion air will not. The process weight per hour will be derived by dividing the total process weight by the number of hours in one complete operation from the beginning of any given process to the completion thereof, excluding any time during which the equipment is idle.

The tabulation follows a curve which is calculated to give some advantage to the small operator on the theory that a smaller corrective equipment costs more to install, per unit of processed material, than does a larger installation.

This works out so that a plant processing 1,000 lb per hr may emit .28% of this process weight whereas one processing 10,000 lb per hr may emit only .10% of the process weight.

In most of the industries involved, this rule requires a recovery ranging from 85% to 93% of the particulate matter normally being emitted to atmosphere. The rule makes no reference to particle size. The subject of particle size was given much study at the time the rule was enacted. Considering the difficulty of obtaining accurate determinations of particle size it was decided that an overall rule governing the total amount of emissions to

Presented before the Engineering Conference, Industrial Hygiene Foundation, Mellon Institute, Pittsburgh, November 14, 1951.

atmosphere would be much simpler, perhaps more just, and much easier to comply with. For these reasons particle size was not made a part of Rule 54. The collection required, however, forces the removal of a large percentage of 5 micron particles and smaller.

Let us consider the application of Rule 54 to the grey iron foundry industry in Southern California. There are, as of the most recent survey, 58 foundries in Los Angeles County producing gray iron castings. At the time of enactment of Rule 54 these foundries all employed the cupola method of melting their metal. They found themselves confronted by the problem of ascertaining what they were contributing to air pollution then of taking what steps they might to correct their condition and enable them to operate within the law. A survey showed that approximately 17,000 lb of solid particulate matter was being emitted to the atmosphere each 24 hours by the foundry industry. Some of these foundries are very small and they grade all the way up to those producing nearly 100 tons of metal per day. Their rate of contribution to the atmospheric pollution was found to be quite uniform, regardless of their size. The smaller ones producing small amounts of castings are contributing in proportion to the amount of metal processed and are therefore, in as serious need of correction as the larger ones.

The problem was to reduce this emission to something in the order of 2,000 lbs. This meant a recovery equipment capable of stopping 85% to 93% of the emissions depending on the local conditions at the plant.

The foundries had two alternatives for correcting their condition. They could continue to utilize cupolas and install corrective equipment, or they could alter their entire process adopting the reverberatory furnace or the electric furnace as melting means.

In the case of the reverberatory furnace they would be relieved of the necessity of installing corrective equipment as the normal amount of emissions from the reverberatory furnace, when properly operated, comes within the allowable limits of Rule 54.

In the case of the electric furance a relatively small bag collector would suffice.

The ones who desired to continue with their cupola operations had the following alternatives which they could adopt: They could install the electrical precipitator or they could lower their gas temperature and install such equipment as bag-cleaners or the various types of baghouses which are currently on the market.

Each foundry had to make its own decision. Of the 58 foundries 15 have abandoned cupola melting and are now using reverberatories and one is using an electric furnace. These 16 are no longer in violation of Rule 54.

The 42 foundries still operating cupolas are currently processing approximately 1,070 tons per day as process weight, and producing about 890 tons per day of metal poured.

With no collection equipment operating they are emitting 14.8 lb per ton of process weight or a total of 15,800 lb per day to the atmosphere. Of this, 7,470 lb is larger than 44 microns, 2,390 lb is between 20 and 44 microns, 1,650 lb is between 10 and 20 microns, 1,550 lb is between 5 and 10 microns and 2,755 lb is smaller than 5 microns in diameter. These last are the particles which do not readily settle and which are principally involved in the lowering of visibility.

The larger particles are relatively easy to collect, but in order to collect a reasonable percentage of the difficult fine particles, equipment of relatively high overall efficiency is necessary.

After many months of tests, investigation, and discussion, the foundries have sorted the problem out as follows: two have converted their cupolas to closed top operation similar to steel blast furnace operation, preventing secondary burning by excluding all secondary air, and have installed small bag collectors; two of them have continued with the cupola operations allowing secondary burning, introducing evaporative cooling and installing electrical precipitators; seven are installing bag collectors with various types of combination coolers; five are still experimenting with some types of scrubbers; the remaining twenty-six have contracted for and are installing bag collectors preceded by evaporative coolers.

It was hoped that during the process of working out these final decisions in the solution of their problems, the industry would find some devices of lesser first cost and cost of maintenance, which would suffice to limit pollution to an acceptable point. Scrubbers and wetwash devices were thoroughly investigated. Most of the principal ones currently on the market and some of local design were tested. There is, however, in the dust from the gray iron cupolas a large percentage of fine material which is not readily wettable and which cannot be removed by mechanical collectors of the centifugal type. This portion of the effluent material from the cupola is the portion which is in the particle size range most troublesome and which should certainly be the part eliminated from the atmosphere. For this reason, mechanical collectors, and the wet washers have not been acceptable as means of suitably reducing the effluents to a point where they could operate within the law and it is for this reason that the foundries have come to the adoption of the finer and better cleaning devices.

The following statistics based on totals and averages are of interest:

Averaging test conducted on ten foundries as a basis we find:

Iron-to-coke ratio	6.37
Tuyere air in standard cfm per lb process weight	0.241 cfm
Stack volume in cfm per lb process weight assuming 100% secondary air and cooling to 500 F	0.891 cfm
Stack temperature maximum	1800 F
Stack temperature average	1400 F
Emissions in grains per standard cfm	.962 grain
Emissions in pounds per hour per ton process weight	14.8 lb

Averaging operating conditions at 42 foundries we find:

Emissions total per day at current melting rates without collection	15,837 lb
Emissions total per day after collectors operating (calculated)	0.9 ton
Process weight total lb per hr.	572,985 lb

Process weight total lb per day ..	2,140,370 lb
Cost to install collection in $ per lb loss per day	$78.40
Cost to install collection in $ per ton process weight per day	$1,162.00
Cost to amortize the investment in 5 yrs. in cents per lb metal cast.	.05 or ½ mil per lb

These last two items are worthy of some careful consideration.

The cost of installation of corrective equipment based on rate of melting or in dollars per ton-day of process weight is perhaps abnormally high. This figure of $1,162 is based on totals of costs completed and contracted for. It must be understood that all of these installations embody some new features such as the application of known and tried equipment to unknown and untried problems. It is probable that the cost includes the development experimental expense.

Also the problem of making all of the installations of a type of apparatus new to many of the shops, all in a very short space of time imposed a load which may have caused manufacturers to protect themselves in their bids.

It seems quite likely that the cost of future installations may be materially less as experience is gained and as more competition among bidders develope.

It is of interest to note that the installation costs of electrical precipitators on two of the large operating plants is equal to the average cost of bag installations on the smaller plants when equated to tonnage melted.

Much of the equipment described is installed and all is in process so that this part of the problem will be out of the way in the next few months. So much for the gray iron industry. I have used it as an illustration, but it is only one of the twenty-odd industries which have been working on their pollution problem.

Other Industries

The law provides that "No person shall construct or operate any equipment which may pollute the atmosphere, without a permit from the Air Pollution Control District", so that the director has a complete appraisal of the entire situation at all times.

It has been the policy of the Air Pollution Control Director and his staff to apply corrective means to every industry, to every plant polluting the atmosphere, whether it be large or whether it be small, because we realize that the correction of the problem and the clearing of the atmosphere in the Los Angeles Basin depends on a total reduction of the pollution coming into the atmosphere and that no source is too small to be considered and to be brought in for its fair share of corrective measures.

The coffee roasting industry, which has some 28 plants in Los Angeles County, roasting some 185 tons of coffee per day has entirely corrected its problem by the installation of secondary burning equipment to raise the temperature of effluent gases to a point where all carbonaceous material and odoriferous material has been eliminated and reduced to water vapor and non-noxious gas.

The fish processing industry, which had such a tremendous odor problem, has corrected its condition by better control of temperatures. The by-products from the fishing operations which are cooked and dried and sold as fertilizer were the principal source of the odors. They are now processed at carefully controlled temperatures so that none of the burning or high temperature treatment which was formerly used is permitted and as a result the odors have been reduced to a point where they are no longer objectionable. The grade of fertilizer is improved and demands a better price.

The non-ferrous foundry industry, of which we have some 250 plants in Los Angeles County, has controlled effluents to a large degree by the use of a slag covering over the molten metal and in other cases where this method was not feasible, they have installed bag collectors.

In the case of the open hearth furnaces operated by two large steel companies in the industry: Columbia Steel Company has installed electrical precipitators and has completely corrected its condition. Bethlehem Steel Company is abandoning its open hearth furnaces in favor of electric furnaces on which they are installing electrical precipitators.

The sulfur dioxide problem from the processing of crude oils in the Los Angeles Basin has been effectively reduced. The tonnage of SO_2 which was released to atmosphere from these sources before our project began was approximately 400 tons per day. This is now approximately 80 tons per day. This reduction has been effected by the installation of absorption equipment, absorbing the hydrogen sufide in ethanolamine for transportation and the conversion into sulfuric acid, or liquid sulfuric acid, or liquid sulfur after desorption, in a suitable plant.

We have personnel on our staff who devote their time to the study of the conditions in the oil refineries and who are working in very close cooperation with the refinery engineering staffs to ferret out and correct conditions which may allow the escape of hydrocarbons to the atmosphere. Wherever sources of hydrocarbon losses have been found in the oil refineries they are being rapidly and effectively corrected by the companies.

Our study of hydrocarbons and their effect on atmosphere and atmospheric pollution has been very extensive. We have been able to produce, synthetically, combinations of hydrocarbons, and oxidizing agents such as ozone and nitric oxides, which we have found to be present in the atmosphere. With these we have produced some of the conditions which are detrimental to plant life and which we find produce eye and throat irritation. We find that certain of the hydrocarbons, particularly the unsaturated hydrocarbons, in the presence of oxidizing agents and in the presence of sunlight and finely divided dust particles are converted to the intermediate products such as the aldehydes, the peroxides, the organic acids and other constituents which are productive of the smog effects. There is still much study to be done.

Automobiles and trucks in view of their very large number become a contributing factor of some importance.

One of the large contributors is the combustion of waste materials. There are in Los Angeles County nearly a million small backyard incinerators operated by individual householders. These contribute some 90 tons daily of aerosols and a like amount of gases such as aldehydes, oxides of nitrogen and organic acids to the pollution of the atmosphere. They burn an average of from one to three pounds of combustible material per person per day.

In addition to this form of combustion, we have the

larger incinerators, from the industrial incinerator which serves the department store and the small apartment house all the way up through the large wood burning incinerator serving the woodworking establishments in the Los Angeles County area. The amount of waste lumber and sawdust which is worked and processed is an undetermined figure as of the present time but the tonnage of this material which is consumed by combustion is tremendous and its contribution to the atmospheric pollution is one of the principal problems with which we deal.

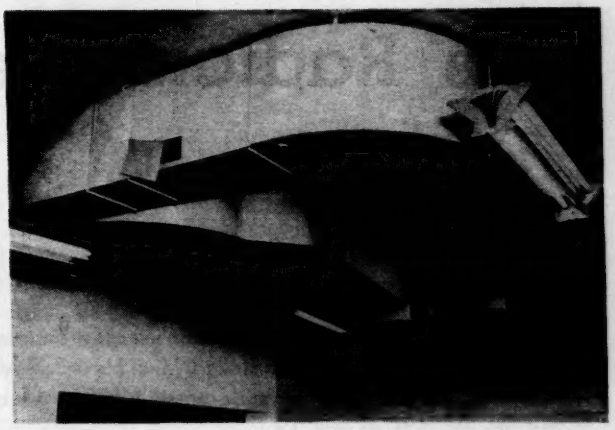
The answer to these incinerator problems lies in the collection and the disposal of this combustible rubbish either in large scale properly designed incinerators or in cut-and-cover operation of dumps, several of which are now in successful operation in Southern California.

Industry has looked on the problem of proper atmospheric sanitation with a great deal of fear and misgiving. However, a complete analysis of the cost of correction when amortized over a reasonable term of years adds only slightly to the product cost. In almost all cases this can be more than offset in savings in better working conditions, better plant efficiency and better public relations. In many cases the operating costs can be offset in these ways and in values of product recovered.

So all this combined effort is bearing results. We are making progress as is evidenced by less days of low visibility, less days of smarting eyes, less crops loss this year than last, better reports from the man in the street. Southern California is well on the way to get back her sunshine.

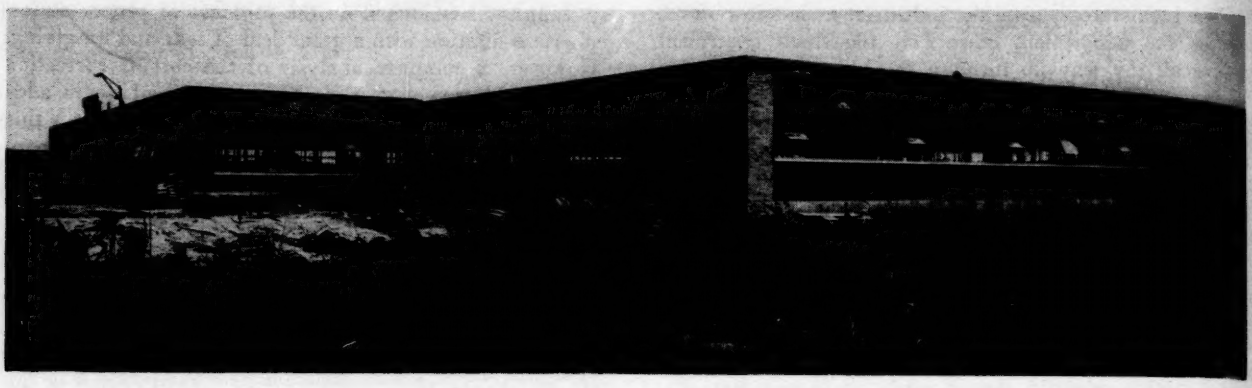
Picture Paragraphs

(Above) Financial institutions still rank at the top among types of business installing snow melting systems under sidewalks in downtown shopping areas. This one at Brooks Bank & Trust Company, Torrington, Conn., required about 400 feet of ¾-inch wrought iron pipe through which hot water is circulated. The sidewalk is 41 feet long and 15 feet wide.



(Above right) Ducts from four upright conditioners combine at the rear wall of the main store area into a single supply duct running through the Tri-City Grocery supermarket, North Alton, Ill. Bypass dampers switch two duct-type unit heaters into two of the ducts for winter heating. Conditioners and heaters are by U. S. Air Conditioning Corp.

(Right) United States Rubber Company recently installed this huge rubber and fabric expansion joint between steam turbine and condensor in Green's Bayou Station of the Houston Lighting and Power Co., Houston, Texas. The expansion joint is 8 ft high, 21 ft wide and 1 ft face to face.



Potdevin Machine Co. building, nearing completion at Teterboro, N. J., will have the country's largest, sinuous coil, radiant slab.

Coil Prefabrication Cuts Radiant Heating Costs

WILLIAM B. FOXHALL
Associate Editor, Heating and Ventilating

The nation's largest sinuous coil radiant heating panel was installed in a New Jersey plant on a competitive basis made possible by shop-fabrication of coils.

ONE OF THE heavy cost factors in estimates for radiant heating is the cost of bending and welding the pipe. Regardless of the size of the job, fabrication of either sinuous or grid coils on the site involves uneconomical practices which seriously affect the cost of the finished installation.

These practices are not necessarily, in themselves, inefficient. That is, they may be carried out with the ulti-

Yard of Atlantic Pipebending and Fabricating Corp., Edgewater, N. J., where coils for largest sinuous coil panel were prefabricated.

mate in good planning and execution. Nevertheless, fabrication of coils is basically a manufacturing operation and competes directly with those portions of conventional systems which have the cost advantages of factory fabrication.

In order to construct a radiant heating coil in the field, equipment for bending and welding must be transported to the site and set up for use. Little or no provision can be made for positioning work. Hence, difficult welding positions are the rule rather than the exception in field fabrication. Labor for field fabrication, even though reasonably expert, is seldom so specialized as to excell in coil fabrication. Drilling and chamfering for welding of supply and return headers is best accomplished with non-portable machinery and must be compromised in the field with consequent risk of leaking or high-friction joints. Dependence on favorable weather conditions is another factor affecting the cost of coil fabrication on the site.

Coils are carried on handtruck for placement on insulating layer of foamed concrete.

Specialization

A means of introducing, for radiant heating, the economical advantages of factory manufacture is the specialized prefabrication of the panel coils. Specialization implies that the coil fabricator has a permanent establishment for the exclusive purpose of making custom built coils and transporting them to the job in such modular units as are consistent with practicality and the engineer's design.

Delivering coils to the job.

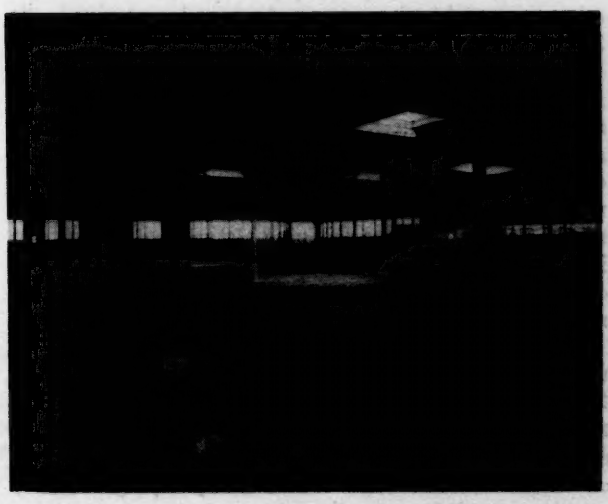
The advantages of prefabrication are particularly notable where sinuous coils are specified. The sinuous coil can be fabricated and compressed accordion-fashion for transportation in trucks to the job. Where the engineer wishes to design his system with prefabrication in mind, he has only to keep the length of straight run in any coil within a limit of about 28 ft so that sections of the coil comprising 200 to 400 linear feet of pipe can be transported in an average trailer truck. In all other respects the engineer is completely free to design the system as he sees fit; although he may gain an additional advantage if the dimensions of the coil are such that it can be made up of standard uncut lengths of pipe bent hairpin fashion in the middle and joined end-to-end down the centerline of the panel. In cases where the manufacturer supplies pipe in random lengths, this latter advantage would, of course, not obtain.

Example

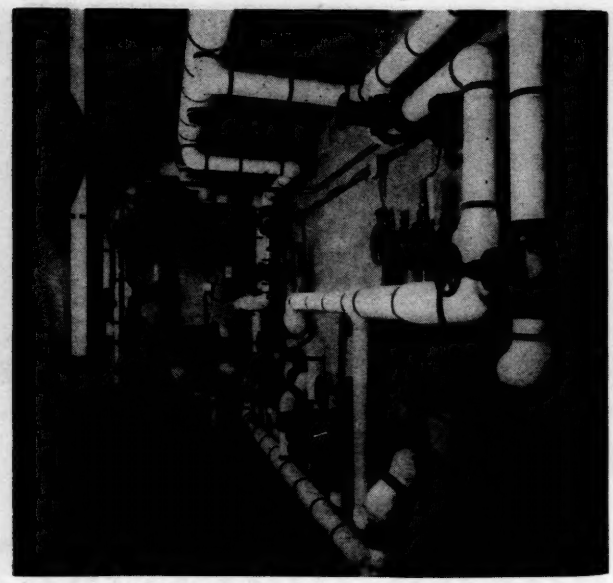
An example of prefabrication applied to a large radiant heating job is at the new plant of the Potdevin Machine Co. in Teterboro, N. J. Floor area of the plant is about 130,000 sq ft on one ground-level floor including about 15,000 sq ft of office area. A radiant heating system, said to be the largest sinuous coil system in the country, was successfully bid in by taking advantage of available facilities for coil prefabrication.

The system is made up of steel pipe embedded in a concrete floor slab 360 ft by 360 ft. Base of the slab is 4 inches of stone over which is laid a 1.5-inch layer of Aircrete. On this, 82 tons of pipe coils consisting of 86,000 ft of Bethlehem Steel Co.'s Rayduct in ¾- to 3-inch sizes were laid and embedded in a 5-inch layer of concrete.

There are five zones in the system, one for the office



Some of the coils in position ready for tying in to supply and return headers.



Controls and circulators in boiler room.

area and four for the 320 ft by 360 ft manufacturing area. Each zone is served by a ⅓-hp circulating pump and is separately controlled by an indoor-outdoor Sarco control system. A 200-hp Superior boiler supplies water for a design drop of 15 degrees through the coils.

Designers

Coils were 80% prefabricated at the plant of the Atlantic Pipebending and Fabricating Corp., Edgewater, N. J., under supervision of S. H. Nitzberg, president of the concern. The longest prefabricated coil contained 480 ft of pipe. All coils were subjected by the fabricator to both an air test at 250 psi and a ball test. The entire system was installed in 30 days by heating contractor Frank Lawton of Paterson, N. J. and underwent a static pressure test for four hours at 200 psi.

The building was designed by David C. Boswell of Boswell Engineering Co., Ridgefield Park, N. J., and the heating system was designed by Martin Christesen, Englewood, N. J. General contractor for the building was Joseph Muscarelli.

Mr. Nitzberg points out that size of the job and proximity of coil fabricating facilities are not necessarily deciding factors in the economy of prefabrication. His firm has handled both single and multiple residential jobs and has shipped prefabricated coils as far west as Missouri.

Pipeline Controls Are Big Business

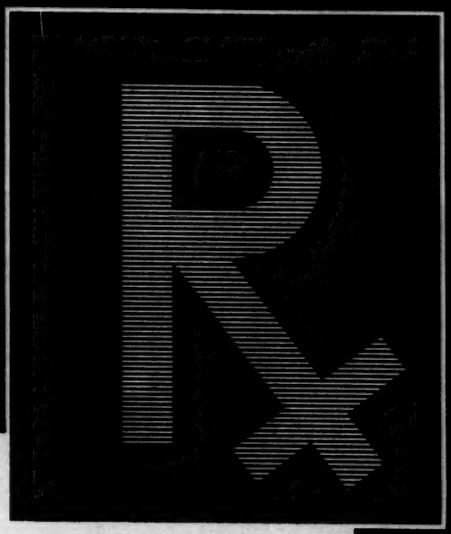
The fastest growing transportation system lies underground. Pipelines are increasing fabulously both in length and in size. In the five years 1946-1950 about 46,000 miles of trunk petroleum and gas line have been laid in the United States alone, and 12,000 more are in the construction or planning stage. As of 1950 the world had about 450,000 miles of pipeline (gathering and trunk), equal to 20 times around the earth. Pipe diameters are increasing. The famous Big Inch (24 inches) line of World War fame is no longer the big line. One half of a 550-mile crude oil line to be built to tap the West Texas field by the West Texas Gulf Pipe Line Company will be 26 inches in diameter. Still larger is the Trans-Arabian line built of 30- and 31-inch pipe (nesting one inside the other to save shipping space). An even larger pipe is the 34-inch natural-gas line in California.

The various pipelines abound with interesting new technical features. The Gulf pipeline, for example, will feature the largest concentration of remote tank-farm pump and manifold valve controls thus far centralized on a control console. On one console will be the control of more than 100 valves and 11 booster pumps. Initially this line will have three pumping stations with 24,000 hp in main-line motor-driven pumps, giving a daily capacity of 300,000 bbl. Booster stations to be added later will raise this to 440,000.

One of the most famous pipelines, the 1261-mile products line of the Plantation Pipe Line Company built from Louisiana to North Carolina in 1941 has been "double-tracked." The original line was 12 and 10 inches in diameter. On the same right of way with it has been laid an 18- and 14-inch line. The same pumping stations, greatly expanded, are used.

The new Plantation line uses a novel way of measuring pressures. At the various pump locations pressures are measured by Baldwin strain gauges. The indications are amplified and transmitted as electrical signals to the control room. Previously this has been done by carrying the refined petroleum in small pipes to the console. While the constructions with this direct method of measurement have been designed with large safety factors, the presence of flammable products lines in the control room does introduce a hazard. Also the small-size pressure pipes sometimes corrode to the point of plugging up. The strain-gauge method is no cheaper, but does establish station conditions highly attractive to pipeline operators.

The men who are in the business of transporting gas and oil in pipelines have taken a leaf from the book of those who transport kilowatts. This is the control of remote apparatus using supervisory control equipment. A booster pumping station and a main-line valve of the Pan American Pipeline in Texas will be controlled entirely by an operator in a station 40 and 80 miles away respectively. The supervisory-control system is basically the same as used by electric-power companies for years but the equipment has been modified to be in keeping with pipeline practice. Signals will be interchanged between the control and the controlled stations over a microwave system previously installed for communication purposes. The attendant at the master station will be able to operate all suction and discharge valves at the distant stations, can start and stop each of two pump motors, and can perform other necessary functions. The control also gives him, automatically, several indications of the state of affairs at the two unattended points, even including the presence of hazardous gas in the station buildings, and any abnormal pressures or bearing temperatures. Various pressures and motor currents are telemetered to him.



AIR CONDITIONING DRUG STORES

J. H. SKIPPER

District Commercial Sales Manager, Southern District,
York Corp., York, Pa.

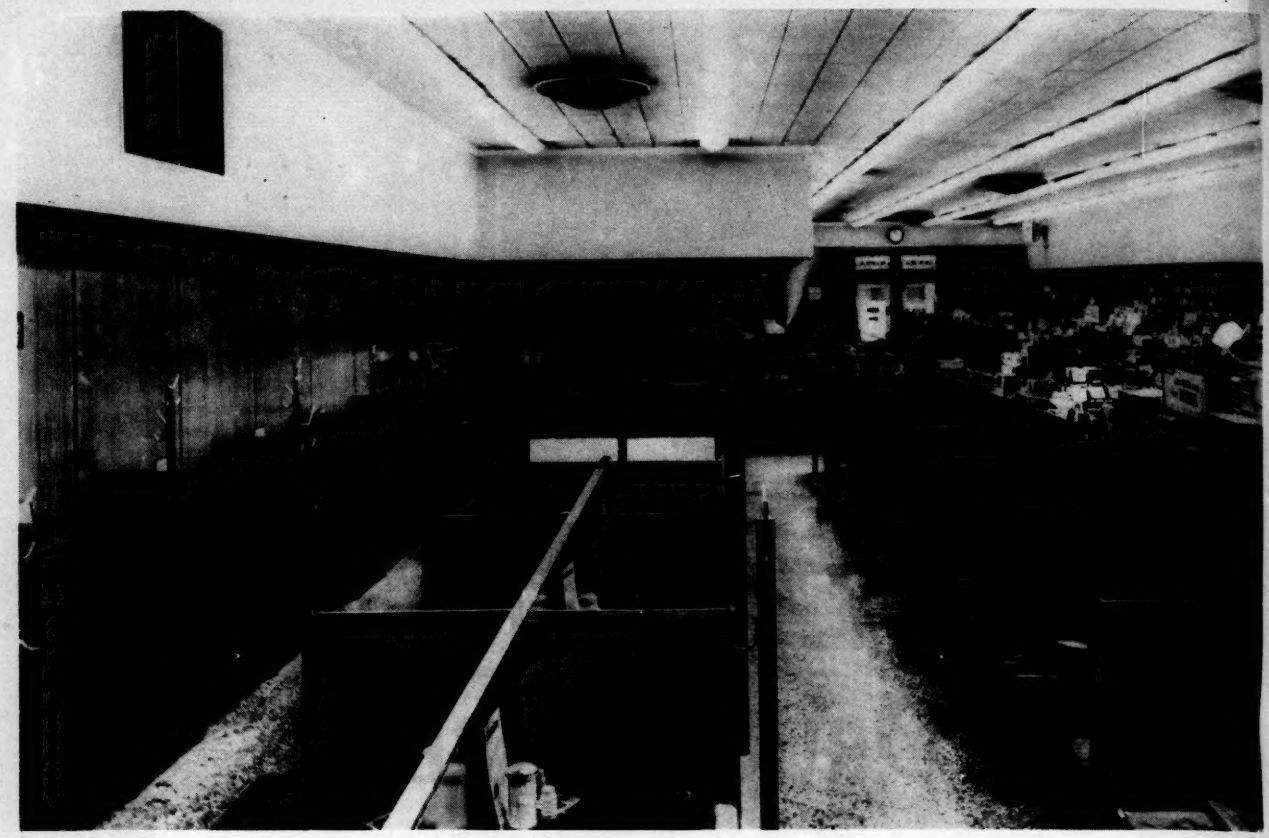


Fig. 1. View of a typical drug store with an area reserved for serving food.

Air Conditioning Drug Stores

J. H. SKIPPER

District Commercial Sales Manager, Southern District,
York Corp., York, Pa.

The design of an air conditioning system for a drug store may be simple for a store limited to the sale of medical products or complex for one which is a combined variety store and restaurant. In addition to general design information, two special problems are presented to show the design procedure to follow.

DRUG stores range in scope from the simple apothecary shop chiefly concerned with the filling of prescriptions and the selling of medical and surgical products, to the super drug store which has expanded so that it is an eating establishment combined with a variety store and a section selling drugs and drug products. In between is the community drug store which, besides being a pharmacy, usually has a soda fountain or lunch counter and carries a variety of other merchandise. Of the total number of drug stores, 65% may be classed as community drug stores.

When the community drug store owner buys an air condition system, he makes one of the largest single capital investments in his business. This investment is usually much larger, in proportion, than is required for a larger installation such as a department store, and the purchaser's concern for his investment is proportionately greater. According to a survey conducted by *Drug Topics*, purchases made by a customer in an air conditioned store are 4.5% greater than those made in a store without air conditioning. Normally, drug stores serving food, expect a sales slump during the summer months. However, air conditioned restaurants experience no such drop—in fact, August is considered one of the large volume business months. Air conditioning also eliminates losses caused by the action of extreme summer temperatures on candy, cosmetics, hygroscopic salts and medicinal products.

DESIGN DATA

Rarely do any two air conditioning installations provide exactly the same design problems. Building construction, time and duration of peak load, ventilation requirements and owner specifications must be considered

since these variables affect equipment selection and the method of installation. In general, drug store air conditioning presents the usual problems encountered in comfort conditioning with the addition of a number of factors that apply specifically to drug stores. These factors include:

Extremely variable loads with high peaks occurring several times during the day. The peak loads in a super drug store are expected during the lunch hour, at office closing time, during the dinner hour and after the theatre. Smaller stores experience peak loads at the same times but they are less intense and of shorter duration.

High sensible and latent heat gain due to gas, steam and electrical appliances which are usually distributed over a wide area.

High concentration of food, body, tobacco smoke and medicinal odors necessitating adequate ventilation and a proper exhaust system.

Unbalanced conditions in the store area adjacent to the kitchen due to heat from the kitchen entering the store through food passing windows and through serving doors.

High exfiltration through entrance doors due to heavy usage during rush hours.

Loss of large quantities of air resulting from incorrect installation of exhaust hoods over steam tables, coffee urns, stoves and other appliances within the conditioned area.

It is good practice to secure architect's drawings of the building in which the store is located. These drawings will usually show structural details which may otherwise be impossible to obtain.

When remodeling or when a new building is involved, it is an advantage to be able to make suggestions concerning the building construction which will result in the best air conditioning installation, the most economical operation, and the most pleasing interior arrangement. Many drug store air conditioning installations have been materially improved through consideration being given to these details while construction work is going on. These details include:

Insulating sunlit roof areas.

Spraying sunlit roof with waste condenser water.

Insulating floors over, or walls adjacent to, kitchens or boiler rooms.

Installing awnings or venetian blinds at sunlit glass.

Ventilating large sunlit show windows.

Installing vestibules, revolving doors or electric-eye doors to prevent excessive exfiltration at the entrances.

Installing doors at stairway to basement.

Reducing to a minimum the size of food passing windows or installing glass doors in these openings.

Installing efficiently designed hoods over gas, steam and electrical appliances located within the conditioned area.

Experience and sound judgment must be the basis for any suggestions pertaining to building details so as to avoid giving the purchaser the impression that air conditioning involves major construction changes. It is obvious that some of the improvements which can be recommended will in many cases be essential; others may be desirable but not practical.

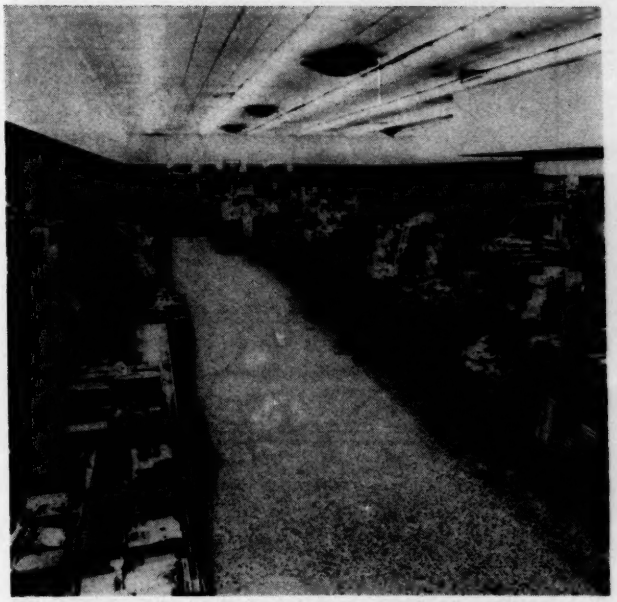


Fig. 2. Concealed ductwork with ceiling outlets installed in a drug store.

Internal Design Conditions

Summer design conditions are well established as to basic effective temperatures. However, it is the consensus of consulting engineers, architects, operating engineers and owners that customer satisfaction is far more important than any specific set of conditions which might be established as standard for the industry. In selecting design conditions, the average time spent by patrons in the conditioned area should be considered.

The ideal design condition must very often be rejected in favor of a modified but still acceptable design condition, because of either equipment cost or performance limitations. This is due primarily to the high multiplier, or the ratio of total heat to sensible heat, which might call for an uneconomical equipment selection unless a different combination of design dry bulb and relative humidity is selected. These revised design conditions, still within the effective temperature zone, will produce equal comfort in occupied areas.

Ventilation

A sufficient quantity of outside air must be introduced through the air conditioning system to dilute odors and tobacco smoke to keep them below objectionable concentration. A total of 15 cfm per person is generally considered satisfactory but in heavily populated metropolitan stores, 20 cfm per occupant is recommended. For drug store applications, never less than 10 cfm per person should be used.

The amount of outside air introduced should at least equal the air exhausted plus one air change per hour. Therefore, the amount of outside air introduced should be based on whichever of the following gives the larger quantity:

(1) Required amount of air per person.
(2) Air exhausted plus one air change per hour.

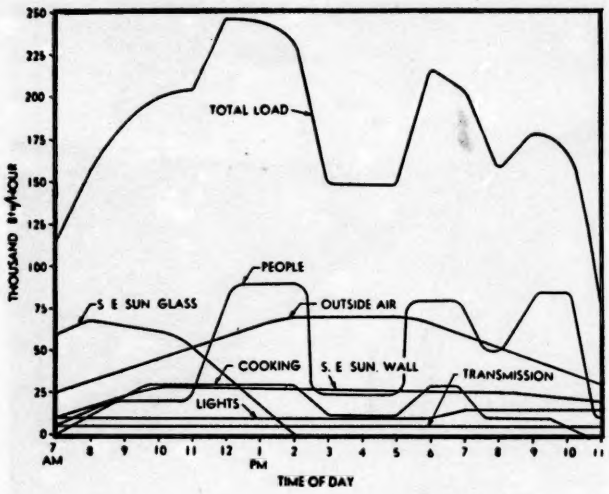


Fig. 3. Cooling load graph.

A positive pressure is maintained in the conditioned space to assure exfiltration through the entrance doors, and the food passing windows and serving doors into the kitchen.

The amount of air to be exhausted from the kitchen has been established as about 4 cfm per square foot of floor area. The air supply should be somewhat less than this amount so that a negative pressure is maintained in the kitchen.

The following three details should be considered in connection with the exhaust system:

(1) Existing hoods should be carefully examined to determine if baffles can be installed or if the hoods should be redesigned or relocated to give the best results with the least amount of exhaust air.

(2) A centrifugal fan is recommended for the exhaust system since the propeller type does not give satisfactory service. The latter, when installed with ductwork, will not produce the high velocity required for an efficient exhaust hood. On existing exhaust systems where the fan is too large, dampers can be installed or the fan fitted with a two-speed motor. This arrangement has the advantage of providing additional fan capacity when food odors and smoke build up during peak periods.

(3) It is sometimes practical to discharge the exhaust air from the conditioned area directly into the kitchen, thereby providing cooler air to the employees working there and also reducing the kitchen supply fan capacity. When the exhaust from the conditioned area is through a hood over a grill, this method cannot be used because of the grease collected from cooking, and the exhaust should be directly to the outside.

Zoning

Zoning should be considered from the standpoint of sun exposures, concentration of people, cooking and other appliances.

In the average drug store, the back of the show windows is plywood panel construction. Some modern stores eliminate the back of the show windows altogether or use glass instead of plywood. The heat from the sun load and the intense illumination used requires that there be sufficient air distribution in these areas. A survey of drug stores indicates that the average temperature inside enclosed show windows is about 30 F higher than the outside temperature, due to sun effect, lighting, or both.

Awnings are usually provided for large show windows having sun exposure of long duration. However, when the intense illumination load occurs at the same time as other peak loads, consideration should be given to ventilating the show windows.

In drug stores where all the food is prepared in the conditioned area or where there are large open show windows, the need for zoning will be self-evident. In smaller stores, particularly those located between two buildings, zone control may not be needed although proper air distribution will be required to handle the concentrated heat loads.

Internal Loads

The number of occupants should be definitely determined and agreed upon by the purchaser, and the heat gain from occupants can then be determined for special conditions. Sometimes a store owner may underestimate the occupant load thinking that the equipment cost will thereby be reduced. Often, an underestimate is unintentional, but new customers attracted by the air-conditioned atmosphere, plus the fact that customers remain in the store longer, account for a greater occupant load than was originally estimated.

Gas, electric and steam appliances in the conditioned area must be accurately checked and the proper heat gain, both sensible and latent, taken into consideration. When proper exhaust hoods are installed over this equipment, 50% of the heat gain values may be used.

Peak Loads

In most cases, the time at which the peak load occurs can be determined by observation. When this is impossible or doubtful, the actual load should be checked for those times when the peak loads are expected. The loads may then be graphically analyzed as shown in Fig. 3. Generally, only the large super drug stores will require such detailed analysis.

Winter Heating

The provision for winter heating and humidification is often specified on drug store applications. The extent to which these winter functions are incorporated depends on conditions applying to each particular installation.

Throughout the Southern states, the heating duty is usually performed by finned coils in the air unit using hot water or low pressure steam. Humidification is accomplished by a spray header with a solenoid valve controlling the water supply. The solenoid valve is actuated by a room or duct humidistat. In the Northern states, drug stores located in buildings not having an excessive amount of exposed surface can also be heated in this same manner.

Where temperatures below freezing are common, it is necessary to preheat the fresh air to prevent the coil from freezing. In stores having large window areas directly open to the inside, direct radiation under the windows is recommended to prevent drafty conditions. In

stores already having a satisfactory heating system, extensive revisions should not be necessary. For all installations, sufficient heating should be provided in the air conditioning system or the outside air duct to heat the fresh air supply and thereby permit fan operation for year-round ventilation.

Air Distribution

Proper air motion is essential to the success of any drug store installation. The human comfort gained by properly cooling and dehumidifying the air may be entirely offset by the discomforts resulting from drafts or air stagnation. The full benefits from air conditioning can be obtained only if the temperature and air motion are uniformly maintained throughout the conditioned area. Either a drafty or a stagnant air condition is particularly objectionable at the lunch counter and in the booth area where the occupants remain seated in one location while eating.

In the smaller stores, ductwork may be unnecessary or held to a minimum if self-contained air conditioners are installed and located to give proper air distribution. In larger stores where a remote or central station system is installed, the volume of air required makes ductwork essential for proper distribution.

Cleaning the Air

Clean air is particularly important because the sale of merchandise depends on a clean, attractive article, and in addition, the drug store is usually an eating establishment. Both recirculated and outside air should be filtered. Spun glass, replacement type filters are generally used because they are practical and reasonable in price. However, there are instances where the cleanable type filter is preferred.

Automatic Control

Emphasis should be placed on simplicity and dependability in selecting automatic controls. Usually, a room or return duct thermostat with one, two or three controls is sufficient to start and stop the condensing unit. High pressure and low pressure cutout switches should be provided with the condensing unit, and the compressor motor should be equipped with overload protection. In larger stores where zoning is required, a motor operated damper may be required to proportion air delivery. These controls are usually electrically operated, but in larger stores, air controls may represent a lower first cost.

CASE HISTORIES

Statement of Problem for Case A

The owner of a typical super drug store located in a Southeastern city requested recommendations on air conditioning. The area to be conditioned consisted of one room on the ground floor of a two-story building, measuring 77 ft long by 42 ft wide and with a ceiling height of 12 ft. This store is illustrated in Fig. 4.

This drug store had a modern food serving department with the kitchen located in the basement. A dumb-waiter brought up the hot food from the kitchen. A dish washer was installed in a small room at the rear of the serving counter. There was a 1.5 ft high by 6.5 ft long pass window into this room.

TABLE 1—DESIGN CONDITIONS FOR CASE A

Type Air	Summer	Winter
Outside	95 F D.B., 75 F W.B.	0 F, D.B.
Inside	80 F D.B., 50% R.H.	68 F, D.B.

The owner allocated space in the basement for the location of equipment as no space was available in the conditioned area. A combination power and lighting circuit was available in the basement, but since it was well loaded, an increase in size was necessary.

For winter heating, three blast type unit heaters were being used in conjunction with a low pressure steam boiler installed in the basement. The owner desired to eliminate these unit heaters to improve the interior appearance of the store.

A conference with the owner established the air conditioning requirements which were agreed upon as follows:

Cool, dehumidify and filter the air supplied to conditioned area during summer months.

Heat, humidify and filter the air supplied to conditioned area during winter months.

Ventilate air-conditioned area during all seasons.

Conceal as much of the air distribution system as possible.

Installation to conform to city, state and federal codes.

Design Factors and Problem Analysis

The drug store was located in an area having the design conditions listed in Table 1.

The following two load factors are from data of Air Conditioning and Refrigerating Machinery Association:
Outside air sensible load factor = 15 Btu per hr per cfm
Outside air latent load factor = 13.8 Btu per hr per cfm

The available service facilities included:

Electric power — 208 volts, 3-phase, 60-cycle. Inadequate.
Steam — 5 psig saturated, as required.
Condensate — gravity return.
Water — 82 F, 65 psig. Restricted use.
Drain facilities — As required.

The internal loads were as follows:

People ..... 125 peak, 82 average
Installed lighting capacity ... 9,400 watts
Lights used on sunny days .. 7,000 watts
Coffee urn, gas fired ..... one 5-gal
Toasters, electric ..... 2,000 watts
Griddle, gas fired ..... 10 cfh natural gas
Steam table, gas fired ..... 18 sq ft
Fan motors ..... 4 hp

Restaurant appliance manufacturers and public utilities have data on the heat output of various appliances for making heat gain or load calculations.

It was considered that at times when there was no sun load on the show windows, an intensive heat load would be imposed due to lighting. A temperature in the

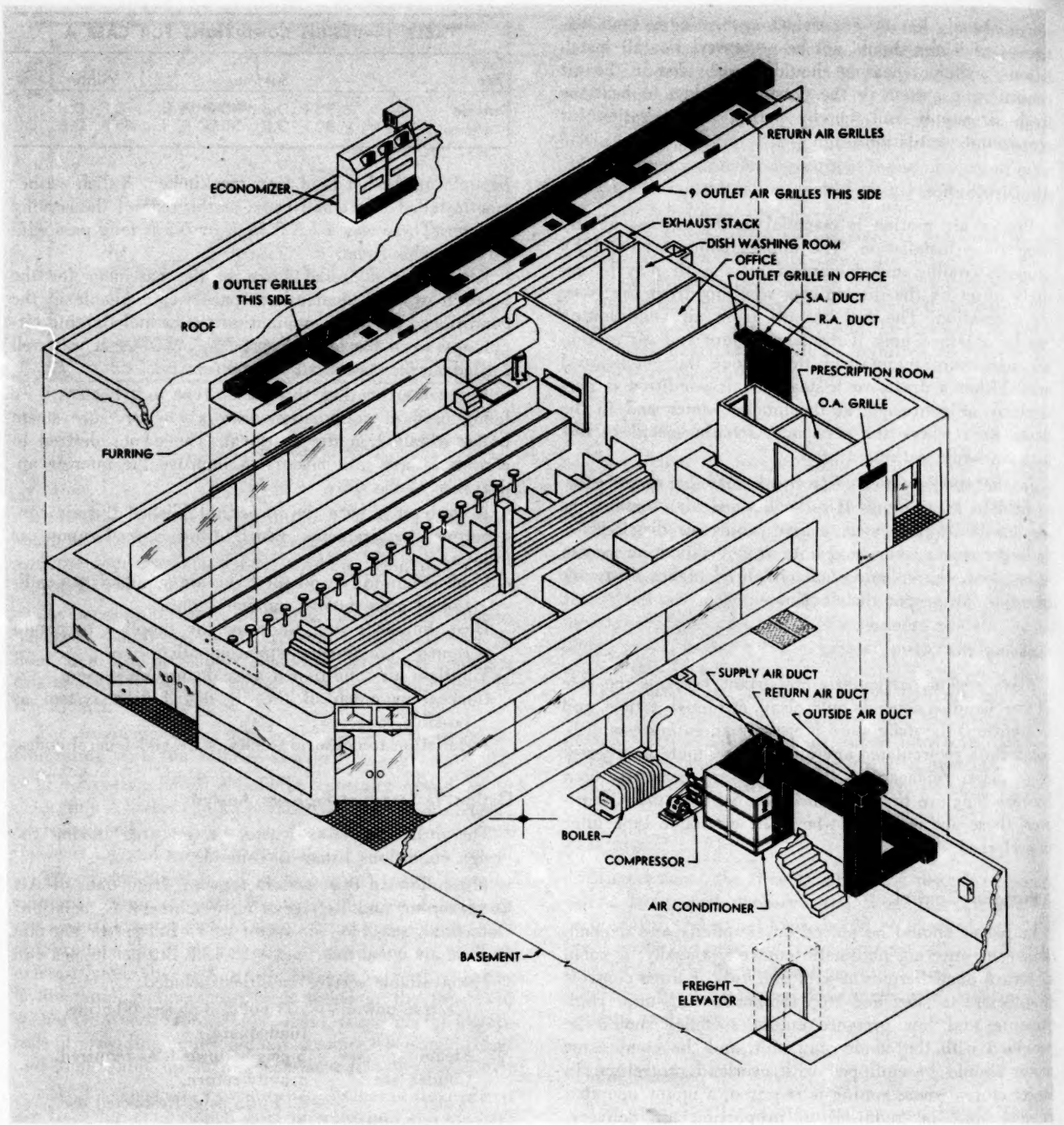


Fig. 4. Cutaway view of installation showing equipment location and center duct arrangement for Case A.

enclosed show window 30 F above the outside temperature was used in the load calculations.

In estimating both the sensible and latent heat load from the appliances within the area, only 50% of the load was taken into account on the basis that the hood would be remodeled and made efficient to remove 50% of the load. This remodeling consisted of placing a baffle in the hood to give a higher velocity with less air, resulting in an exhaust through the hood of around 1,400 cfm. This gave a slight pressure in the store and helped to prevent infiltration.

A total of 2,000 cfm of outside air was selected—the quantity of air exhausted by the hood arrangement plus one air change per hour. This proved sufficient to meet ventilation requirements of 15 cfm per person for 125 occupants. It was decided to use the average number of occupants, 82 persons, in the people load calculations and accept a temperature slip for the peak occupancy condition if necessary. This was discussed with and was agreeable to the owner.

Since the store owner allotted space in the basement for the equipment, the selection of a self-contained unit for remote installation or an air conditioner with separate condensing unit was indicated. Water costs were high and the store owner desired an economizer or a cooling tower.

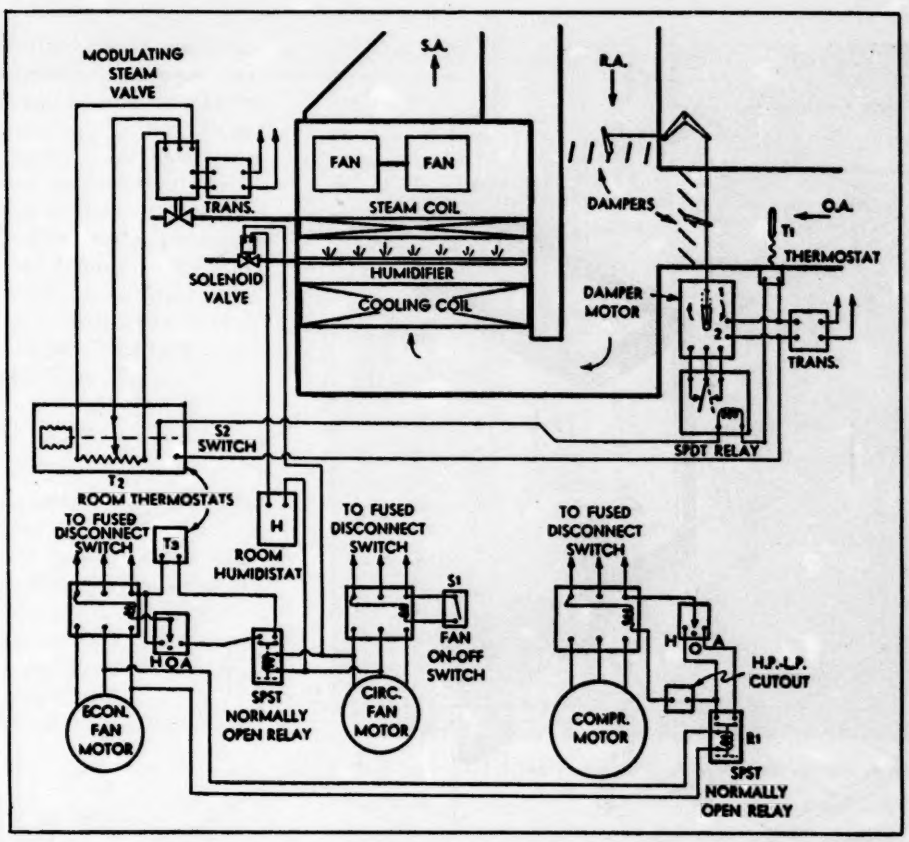


Fig. 5. Control system, Case A, which permits use of outside air for cooling when outside air temperature is low enough.

Fig. 4 shows the arrangement of the ductwork. The location of the distribution duct was chosen to conform with the existing beam down the center of the store. The duct and the beam were furred in the full length of the store to improve the appearance of the installation. The furring, with return air grilles in the underside, also served as a return air duct.

Load Calculations

Summer Cooling	Btu per Hr
SENSIBLE LOAD	
Outside air = 2,000 cfm x 15 Btu per hr per cfm (outside air sensible load factor)	30,000
Walls, glass, floor and ceiling heat leakage...	67,000
People = 82 (average number of persons) x 200 Btu per hr heat gain per person	16,400
Lights = 7,000 watts x 3.4 Btu per hr per watt	23,800
Coffee urn = 3,900 (Btu per hr heat gain) x 0.5*	1,950
Griddle = 10 cu ft x 900 (Btu per hr per cu ft heat gain) x 0.5*	4,500
Steam table = 18 sq ft x 400 (Btu per hr per sq ft heat gain)	7,200
Fan motor = 4 hp x 2,545 (Btu per hr per hp)	10,200
Toaster = 2,000 watts x 3.4 (Btu per hr per watt) x 0.5*	3,400
Internal sensible =	134,450
Total sensible =	164,450
LATENT LOAD	
Outside air = 2,000 cfm x 13.8 Btu per hr per cfm (outside air latent load factor)	27,600
People = 82 x 300 Btu per hr heat gain per person	24,600
Coffee urn = 3,900 (Btu per hr heat gain) x 0.5*	1,950
Griddle = 10 cu ft x 100 (Btu per hr per cu ft heat gain) x 0.5*	500
Steam table = 18 sq ft x 900 (Btu per hr per sq ft heat gain)	16,200
Internal latent =	43,250
Total latent =	70,850
Winter Heating	Btu per Hr
Heat leakage ..... =	51,560
Humidification = $\frac{2{,}000}{13.8} \times \frac{33 \text{ gr per lb}\dagger}{7{,}000} \times 1{,}060 \times 60$ =	43,500
Outside air = $\frac{2{,}000}{13.8} \times 68 \times 0.24 \times 60$ =	145,000
Total Heating =	240,060

TABLE 2—SUMMARY OF LOAD CALCULATIONS

Item	Internal	Overall
Sensible, tons	11.2	13.7
Latent, tons	3.6	5.9
Total, tons	14.8	19.6
Multiplier	1.32	1.43

*Figured on the basis that the remodeled hood will remove 50% of the heat load.

†Moisture present in air at comfort conditions of 68 F and 30% R.H.

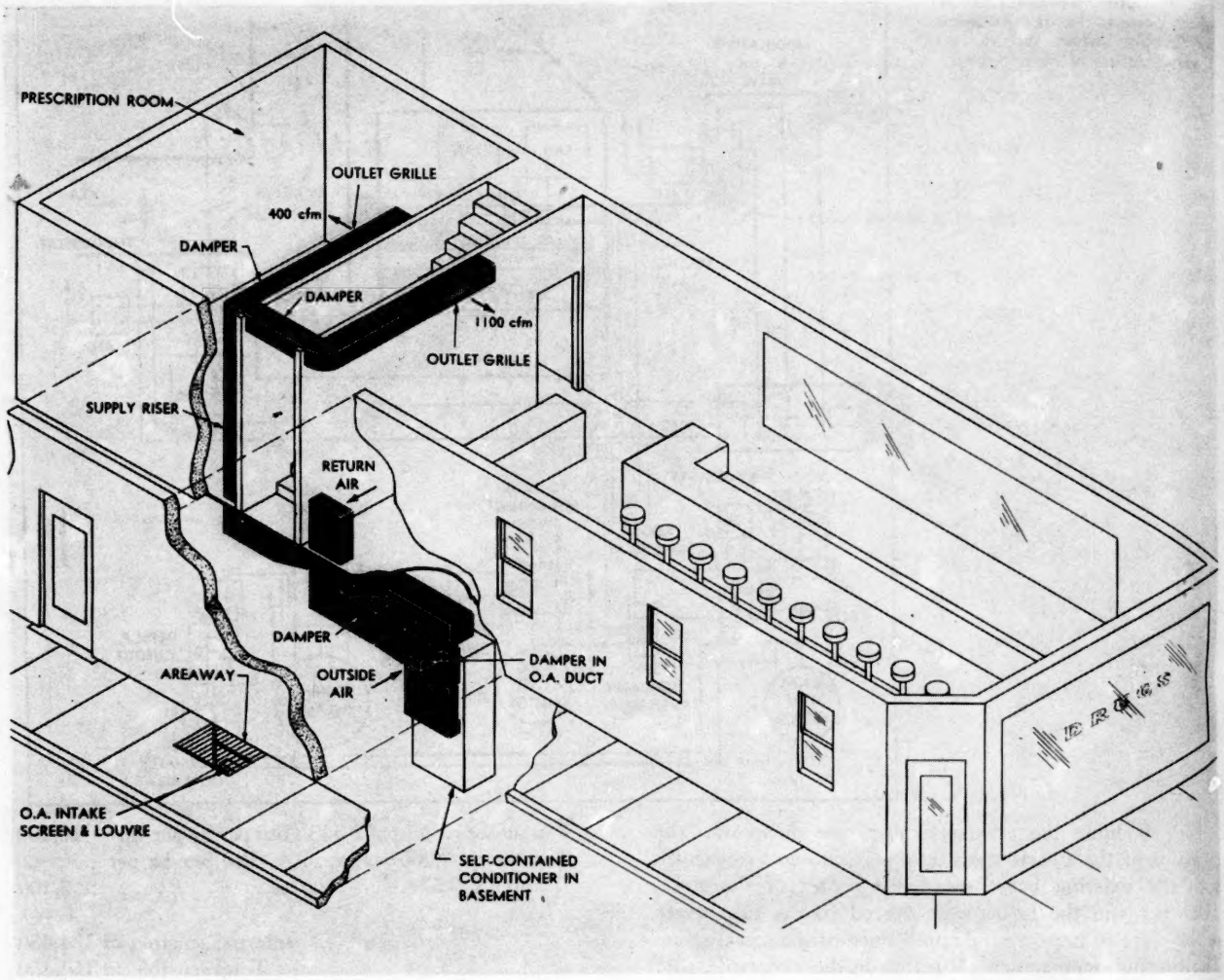


Fig. 6. Cutaway view of installation, Case B, showing equipment and ductwork location.

Equipment Selection

Assuming a 20 F diffusion range with 11.2 tons internal sensible load, the quantity of air to be circulated was calculated

$$\frac{11.2 \times 200 \times 13.8}{0.24 \times 20\ \text{F}} = 6{,}500\ \text{cfm}$$

Where 200 = Btu per minute per ton of load; 13.8 = specific volume of air and 0.24 = specific heat of air.

With 2,000 cfm of outside air, the entering air condition to the coil was 84.5 F dry bulb and 47% relative humidity. Since the total tonnage exceeded the capacity of the largest available size of self-contained conditioner and the use of two such units could not be justified economically, it was decided to use an air conditioner with a separate condensing system.

A vertical air conditioner was selected having a 72-inch coil, 8 rows deep. A 20 hp compressor unit and a 20-ton economizer were selected for the high side. Estimated first cost of an economizer proved to be less than a shell and tube condenser and cooling tower in this particular application.

There was ample space in the basement to locate the air conditioner and compressor unit. Since the building was only two stories high it was more practical to locate the economizer on the roof than to place it in the basement.

A steam heating coil with a capacity of 240,000 Btu per hr and of a size to fit into the air conditioner was selected for winter heating. Winter humidification was provided by a spray header located in the air conditioner to direct water on the entering air side of the heating coil. The header was selected to handle up to 50 lb of water per hour at 65 psig pressure.

Controls

The control system, as shown in Fig. 5, provides an automatic means of utilizing 100% outside air for cooling when outside air temperature is low enough.

Heating Cycle—Room humidistat opens solenoid valve upon a call for humidification, admitting water to humidifier sprays. The solenoid valve is interlocked with fan circuit so that when the circulating fan is off, the solenoid valve cannot open. On a rising room temperature, the modulating type room thermostat T_2 gradually closes modulating steam valve. Damper motor is in position 2, holding return air damper open full and outside air damper at its minimum setting.

Between Season Cooling—On further rise in room temperature, switch S_2 in room thermostat T_2 closes. Providing the outside air temperature is cool enough as determined by the setting of thermostat T_1, the damper motor will move to position 1, opening the outside air damper for maximum outside air and closing the return air damper. When the outside air temperature rises above the setting of T_1 the damper motor returns to position 2, closing the outside air damper to its minimum setting and opening the return air damper.

Summer Air Conditioning—On a further rise in room temperature, room thermostat T_3 starts economizer, which in turn starts compressor through relay R_1.

Bill of Material

By Contractor

1 — 20 hp Freon 12 compressor unit with V-belt drive and 50% capacity reducers.
1 — 20 hp motor and starter.
1 — Economizer complete with fan, circulating pump, motors, starter and subcooling coil.
1 — Remote air conditioner complete with 72-inch 8-row copper finned cooling coil, fan motor and drive.
1 — Heating coil installed in conditioner.
1 — Humidifier spray assembly installed in conditioner.

Necessary Contractor Items

Freon 12 refrigerant.
Sheet metal ductwork including air outlets.
Insulation of ducts, steam and refrigerant piping.
Refrigerant piping.
Water and drain lines from within 10 ft of equipment.
Steam and return connections.
Electrical wiring.
Freight, hauling and rigging.
Erection and supervision.

Necessary By Purchaser

Increased power service.

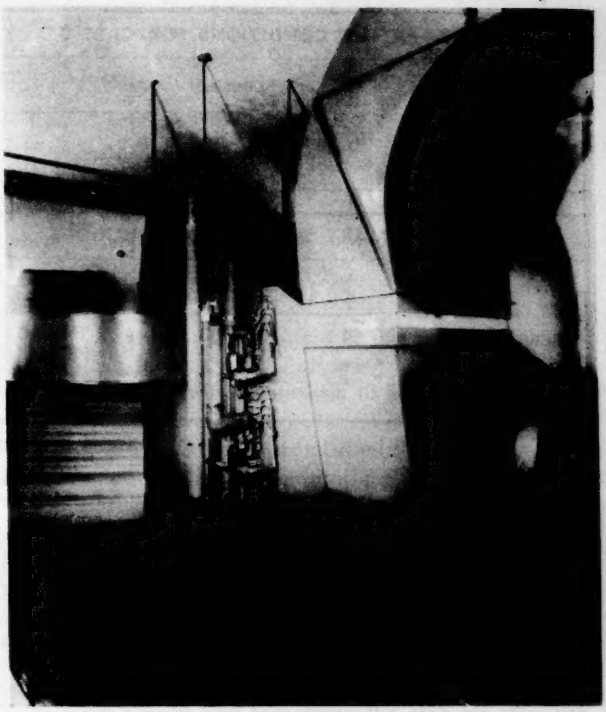


Fig. 7. A 25 hp Freon condensing unit that serves a Los Angeles drug store.

Remodeling of exhaust hood.
Water and drain lines to within 10 ft. of equipment.
Painting and redecorating.
Partition around equipment.

Statement of Problem for Case B

The owner of a typical small community drug store wished to install summer air conditioning. The store area consisted of the first floor of a two-story building located

Fig. 8. Interior view of the Owl Drug Store, Los Angeles, Cal. This is considered the largest drug store in the world.

TABLE 3—DESIGN CONDITIONS FOR CASE B

Type Air	Summer
Outside	95 F dry bulb, 78 F wet bulb
Inside	80 F dry bulb, 50% relative humidity

TABLE 4—SUMMARY OF LOAD CALCULATIONS

Item	Internal	Overall
Sensible, tons	2.28	2.53
Latent, tons	.52	.95
Total, tons	2.80	3.48
Multiplier	1.23	1.38

on a corner with an adjoining building on one side and an alley along the back. In the rear of the store was a prescription room 12 by 16.5 ft, separated from the front sales area by a staircase to the second floor. The front sales area measured 16.5 ft wide by 37 ft long with a 10 ft ceiling. To conserve floor space, the owner wished to have the equipment located outside of the sales area.

Design Factors

The drug store was located in an area having the design conditions given in Table 3.

The following two load factors are from the ACRMA:

Outside air sensible load factor = 15 Btu per hr per cfm

Outside air latent load factor = 25.5 Btu per hr per cfm

The available service facilities included:

Electric power — 220 volts, 3-phase, 60-cycle.
Water — 81 F, use unrestricted.
Drain facilities — As required.

The internal loads were as follows:

People, number	20
Lights, watts	1,800
Electric toaster, watts	500
Electric coffee brewer, gallon	½

There was no additional food preparing apparatus or exhaust fan. Outside air was based on 10 cfm per person.

Analysis of Problem

The small size of this store suggested the use of a self-contained conditioner. Since the customer did not want to use valuable sales space for the location of the equipment, a place for the air conditioner was found in the basement near an areaway. This location made it necessary to run ductwork. To provide good air distribution to the sales area and the prescription room with a minimum of ductwork, the arrangement shown in Fig. 5 was used.

Load Calculations

Sensible Load	Btu per Hr
Outside air = 200 cfm x 15 Btu per hr per cfm (outside air sensible load factor)	3,000
Walls, glass, floor and ceiling heat leakage	13,500
People = 20 x 200 Btu per hr heat gain per person	4,000
Lights = 1,800 watts x 3.4 Btu per hr per watt	6,100
Fan motor = 0.1 ton refrig. x 12,000 Btu per hr per ton	1,200

TABLE 5—INVESTMENT ANALYSIS FOR TWO PROBLEMS

Cost or Fixed Charges	Case A		Case B	
Total Installed Cost	$11,455		$1,790	
Annual operating cost	For this type of business and for the geographical location of each installation, the equivalent full load operating time for the air conditioning equipment was estimated for a 5-month cooling season at:			
	1,630 hrs		1,330 hrs	
Power cost	1,630 hrs x 27½ hp x .746 kw/hp / .90 eff = 37,180 kwh		1,330 hrs x 3.6 kw = 4,790 kwh	
	37,180 kwh @ $.017/kwh =	$ 632	4,790 kwh @ $.015/kwh =	$ 72
Water cost	1,630 hrs x 19.6 tons x .06 gpm/ton x 60 = 115,000 gal		1,330 hrs x 3.53 tons x 2 gpm/ton x 60 = 564,000 gal	
	115,000 gal @ $.30/M gal =	35	564,000 gal @ $.10/M gal =	56
Refrigerant oil and repairs		275		60
Total (1)		942		188
Annual fixed charges				
Depreciation	10% of $11,455 =	1,146	10% of $1,790 =	179
Interest on investment	½ of 5% of $11,455 =	286	½ of 5% of $1,790 =	45
Insurance and taxes	2% of $11,455 =	229	2% of $1,790 =	36
Total (2)		1,661		260
Total annual investment cost	(1) + (2)	$2,603		$448

	Btu per Hr
Coffee brewer (½ gal) heat gain	900
Toaster = 500 watts x 3.4	1,700
Internal sensible =	27,400
Total sensible =	30,400

LATENT LOAD

Outside air = 200 cfm x 25.5 Btu per hr per cfm (outside air latent load factor)	5,100
People = 20 x 300 Btu per hr heat gain per person	6,000
Coffee brewer, heat gain	220
Internal latent =	6,220
Total latent =	11,320

Equipment Selection

A 3 hp self-contained conditioner that would produce 3.53 tons with entering air conditions of 82 F dry bulb and 50% relative humidity was selected. This unit circulates 1,500 cfm of air, giving a diffusion range of around 18 F.

Hand dampers were installed in the outside air duct, the two branch distribution ducts and the return air duct to provide a means of balancing the air. Fire protection dampers with fusible links were used where the return air duct and supply riser passed through the floor. Also, a firestat was installed in the return air plenum at the rear of the unit, arranged to cut off the compressor and fan. Fireproof materials were used throughout in this work.

Bill of Material

By Contractor

1 — 3 hp Freon 12 self-contained conditioner.
1 — Firestat.

Necessary Contractor Items

Sheet metal ductwork, grilles and dampers.
Duct insulation.
Freight, hauling and rigging.

The average annual sales used in the investment analysis, Table 5, are based on a survey of 20 stores. The average net profit was determined to be 12½%.

As previously mentioned, surveys also disclose the following results from air conditioning:

Increases annual customer purchases of drugs, cosmetics and other merchandise, 4½%.

Eliminates the usual 20% summer business slump in the food department.

Customer traffic increases 25 to 30% resulting in an average additional increase of 2% in gross sales.

Using these factors the resulting return on investment is estimated for each case history in Tables 6 and 7.

These two case histories show the step by step procedure that is followed in examining a specific problem and in arriving at a conclusion regarding the type and size system to install.

TABLE 6—ANALYSIS OF DEPARTMENT SALES FOR CASE A

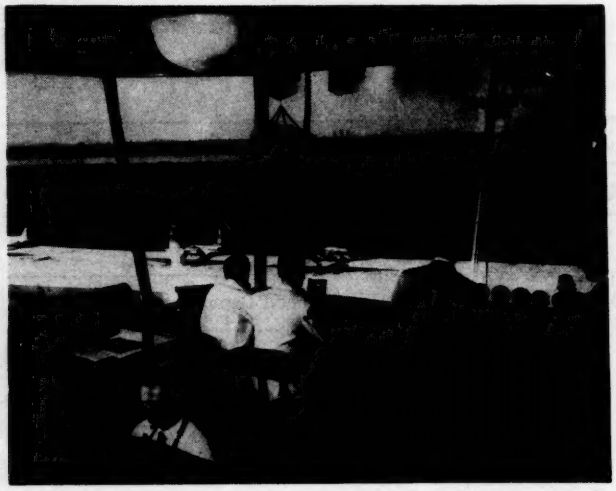
Department Sales and Profits	$500,000 Annual Sales			
	Drugs, Cosmetics, Other Merchandise		Food Department	
Department sales	65% of $500,000	= $325,000	35% of $500,000	= $175,000
Additional sales	4½% of $325,000	= $ 14,625	20% of $175,000 x 5/12	= $ 14,583
Due to air conditioning	2% of $325,000	= $ 6,500	2% of $175,000	= $ 3,500
Total additional sales		$39,208		
Additional profit due to air conditioning		12½% of $39,208 = $4,901		
Return on investment		20%		

TABLE 7—ANALYSIS OF DEPARTMENT SALES FOR CASE B

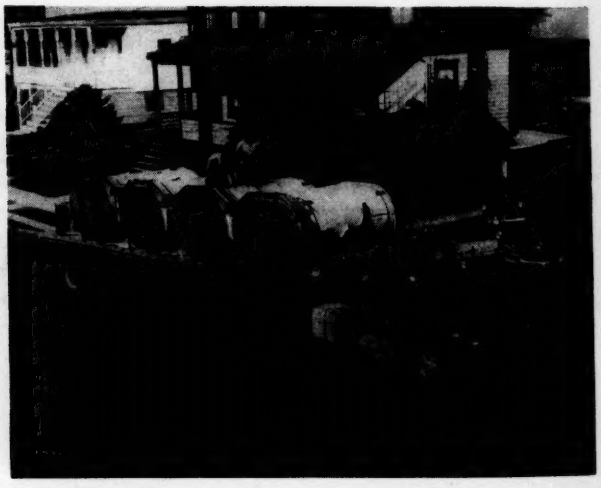
Department Sales and Profits	$60,000 Annual Sales			
	Drugs, Cosmetics, Other Merchandise		Food Department	
Department sales	65% of $60,000	= $39,000	35% of $60,000	= $21,000
Additional sales	4½% of $39,000	= $ 1,755	20% of $21,000 x 5/12	= $ 1,750
Due to air conditioning	2% of $39,000	= $ 780	2% of $21,000	= $ 420
Total additional sales		$4,705		
Additional profit due to air conditioning		12½% of $4,705 = $588		
Return on investment		8%		

In a two-story recess atop Pittsburgh's newest and largest skyscraper is this 97-foot long cooling tower, part of the multi-million-dollar air conditioning system which will provide the building's 4200 occupants with the ultimate in man-made weather, This tower, built of redwood with brass bolts and copper nails, handles about 7650 gallons of condenser water per minute, dropping its temperature about 10 degrees. The condenser water is used in refrigeration equipment in the third basement of the 41-story building, occupied by U. S. Steel Company and Mellon National Bank & Trust Co. Four huge stainless steel fans powered by 30-horsepower motors blow air on the condenser water to cool it. The tower was recessed in the building so as not to detract from appearance.

Picture Paragraphs



Solex, heat-absorbing, glare-reducing glass used in airport control towers and other applications where extreme heat and glare have been a problem, is now being mass-produced by the Pittsburgh Plate Glass Company and will appear in 1952 automobiles and public buildings.



4,000,000 Btu start on a trans-continental ride as a giant truck trailer is readied for the trip from East Port Chester, Conn., to St. Louis. The Thermobloc unit heaters were manufactured by Prat-Daniel Corp., and Valley Steel Products Co. of St. Louis sent their own truck east to pick them up.

Dual function of a direct-fired heater at bus storage terminal of Buffalo Transit Co. is shown here. Installed near the wash rack, it is utilized to dry buses after washing, as well as to provide heat for the area in which it is located.

Heating and Ventilating a Bus Garage

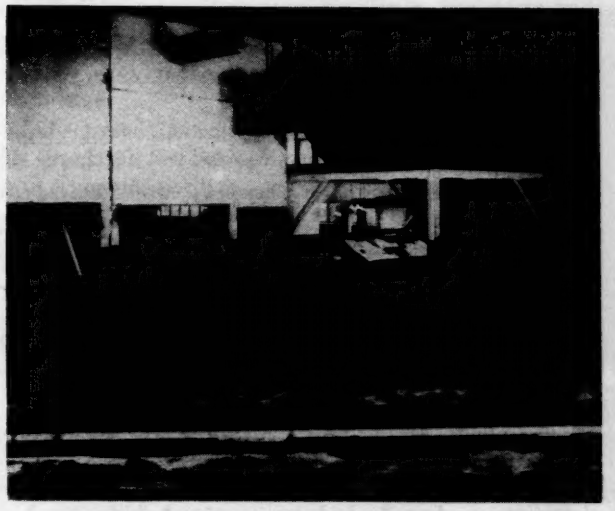
In addition to problems of operating and maintaining a bus fleet, bus companies often are confronted with the problem of heating and ventilating their storage and repair facilities. Following is an account of how one company solved such a problem.

As the terminal of the Buffalo Transit Co. in Buffalo, New York, expanded over the years to include three buildings having some 33,600 sq ft of floor area, the heating plant proved to be inadequate. The lowest bid received for a new boiler plant amounted to $32,000, almost $1 a square foot; and a new boiler plant would take up valuable floor space in the terminal.

Four, large, self-contained, direct-fired space heaters were installed at a complete cost of $14,887, and with no loss of space. The heaters selected for the job are Dravo Counterflo heaters. Three different models were installed, two with output capacities of 750,000 Btu per hr; one with a capacity of 1,000,000 Btu per hr and one, 500,000 Btu per hr. All four are fired by light fuel oil.

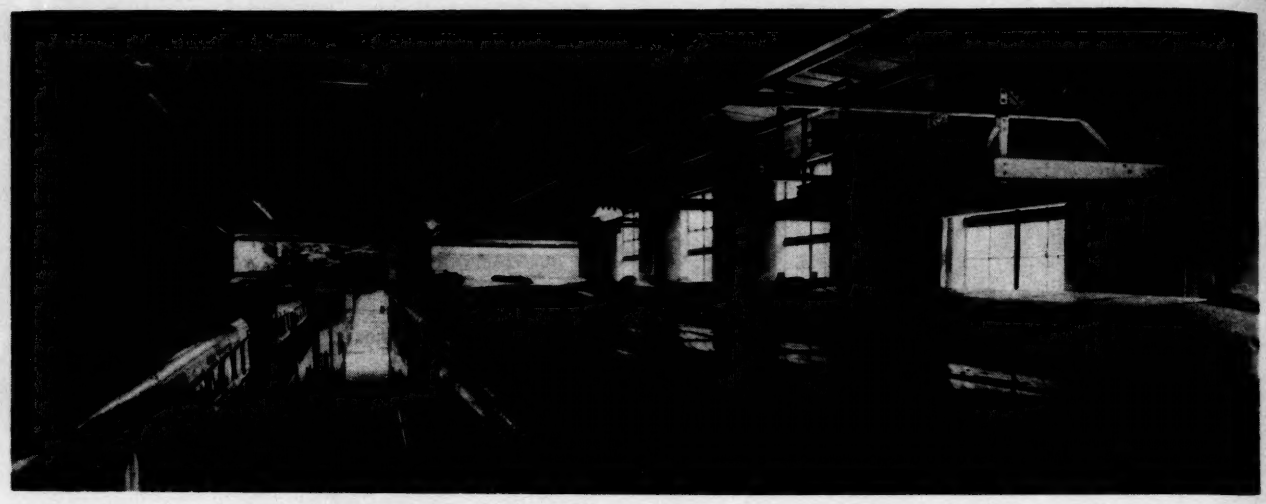
Since the heaters were installed, the company reports that uniform temperatures have been maintained and annoying drafts have been eliminated during cold weather. Heat losses of the buildings, figured on the basis of 60F indoor temperature with 0F outdoors, amount to 2,800,000 Btu per hr.

One of the heaters has been found useful for a dual function. Besides heating the area in which it is located, this heater also is utilized to dry buses, after they go through the wash rack, by discharging warm air on them.



Through the use of a short run of ductwork, this heater also serves the area behind the partition.

All four heaters are installed in a horizontal position, either suspended from roof trusses, which are 15 ft above



Despite three large doors at either end, which have to be opened frequently, bus storage building is kept comfortably warm by two heaters, suspended in a horizontal position about 15 feet above the floor.

the floor, or mounted on steel platforms. It was possible to install them this way without major alterations because they have stainless steel combustion chambers which eliminate the need for refractory lining. Space below the heaters is used for storage.

The only ductwork required for the entire installation was a short run from one heater to a partitioned section of one of the buildings. This, of course, was part of the reason for the low installed cost of the system. The only piping required for the heaters was that carrying fuel oil from a 4,000-gallon underground storage tank. Each heater is controlled through the action of an individual thermostat.

In the largest of the three buildings, the winter heating problem was more critical than the other two because of three bus door openings at each end of the structure. These doors are opened frequently, allowing chilly air to enter. The position of the heaters and their large air-handling capacity prevent an uncomfortable accumulation of cold air. One discharge outlet from each of the two heaters in this building is directed towards the doorway to blanket the area with warm air, being forced out with a velocity of some 2000 fpm.

During the summer months when heat is not required, the heater fans are operated to help circulate air and ventilate the buildings.

New Uses For Cold Water

The inventive genius of American industry has found countless new uses for chilled water that were scarcely dreamed of six months ago.

Disclosure of some of these applications was made by John A. Gilbreath, assistant vice-president in charge of air conditioning for Servel, Inc., at the company's first air conditioning conference in Chicago.

Deep secrecy surrounds some of the uses that purchasers have found for Servel's new steam-operated water chiller. In several instances, companies have refused to reveal how they intend to use the 25-ton units in their processing. "We frankly don't know what some industries are doing with our water chiller," Mr. Gilbreat said, "and they won't tell us."

Some plants, Mr. Gilbreath revealed, are using water chillers to condense vapor and thus recover the carbon tetrachloride used in degreasing production parts. One manufacturer has hooked up a water chiller to his smokestack to recover coal tar flue products. Chemical industries have found that they can use cold water from the Servel unit to dehydrate hydrogen gaseous mixtures —and thus cut their production costs.

A packer of shelled nuts discovered that he could keep nuts from turning rancid by using the water chiller to control atmospheric conditions in his storage rooms. Not only that—but he can also use the shells from the nuts as fuel for the steam boiler that operates the water chiller.

A Michigan cherry packer has improved the performance of his automatic pitting machine by chilling the cherries before they are pitted.

Although the water chiller has been on the market for less than a year, it has already found wide acceptance in scores of industries. It is used for cooling air, liquids or equipment in connection with instrument calibration, precision assembly, drafting, soft drink bottling, rubber manufacture, printing, textile manufacture, leather tanning, and many other applications where temperature control is important for quality control or production.

One of the special uses of this unit, Mr. Gilbreath said, is for pre-cooling air for air compressors and internal combustion engines to increase their capacity and improve their performance characteristics.

The water chiller works on the absorption refrigeration principle. This system requires no motor, compressor or moving parts. Steam from any source may be used to operate the cooling system. It may be steam from a heating boiler, exhaust from a steam turbine, waste steam from vapor-phase cooling of Diesel engine cylinder jackets, waste heat from gas internal combustion engines, or district steam.

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

Conducted by
NATHAN N. WOLPERT
Associate Editor

This Month's Problem

We have one run of metal pipe in a process fluid line that has given us some trouble in the past. A suggestion has been made to replace this run with glass pipe. What are the limitations of glass pipe? How do the costs compare with other pipe?

IN the box on this page is the problem that forms the basis for this month's discussion. It is devoted to the important question of glass piping for use in industry. Also included in this article are the problems that are scheduled for discussion in the March and April issues.

Should you have a question that you would like to see discussed in this department that is of interest to a number of industrial plant engineers, or if you have some comments that you would like to add to the discussion scheduled for these two future problems, you are invited to write to the Editor. Such letters are always welcome.

Discussion

From the standpoint of corrosion resistance, glass piping is satisfactory for practically any chemical with the exception of hydrofluoric acid and hot concentrated alkaline solutions. In sizes up to 3-inch diameter, it is not recommended for working pressures above 50 psi; 4-inch above 35 psi, and 6-inch above 20 psi.

Reasonable care must be used in layout and installation becausc all working stresses must be maintained within moderate values.

Glass piping should not be located in areas that are exposed to traffic. It is usually desirable to run the pipe relatively close to building structures, such as walls, columns and ceilings, where conditions are favorable for obtaining a firm support. When very long hanger rods are used, there may be some tendency for the line to sway under the effect of surging or other forces. When it is necessary to run a line through exposed areas, protective measures should be taken. Guards can be made from expanded metal screen or other materials.

Drainage points for the line should be selected and the horizontal lines should be given the proper pitch—at least ½ inch in 10 ft. When a line is to be connected to a bottom outlet of a tank, it is desirable that a valve be interposed between this outlet and the line. In the event of trouble in the line, flow from the tank can be stopped.

The location of anchor points, and their effects on line stability, should be given consideration. If the degree of flexibility is inadequate, the layout should be revised to meet this condition. All valves and heavy parts should be supported independently, and not from the glass pipe. They are, therefore, to be considered as anchor points in the line.

Hangers on horizontal runs should be well spaced from elbows leading from fixed vertical runs. If such flexibility is not permitted between the hanger and the elbow, high bending stresses may then result in this section.

Various forces act on a section of pipe in a line which set up corresponding stress components in the pipe. The more important stresses to be considered are:

(1) Those resulting from the internal pressure of such as (a) the tangential or hoop stress in the pipe wall and (b) axial or longitudinal stress in the pipe wall.

(2) Bending stresses caused by forces applied to bring

Problems for Coming Issues

March Issue

Because of the large amount of abrasive material present in the air of our foundry, normal duct design and installation cannot be used. What can you suggest for us to follow that would prolong the life of the ducts and possibly increase their efficiency?

April Issue

In the past we have been using cement joints when laying tile pipe. This joint does not permit settling of pipe and we have experienced some broken pipe. Hot poured compound joints have been recommended. What compound can be used? Will it permit some movement?

RECOMMENDED PRESSURES AND STRESSES FOR GLASS PIPE

I. D. Pipe Size, Inch	Wall Thickness, Inch	Max. Pressure	Pressure Stresses		Bending	
			Hoop	Axial		
		Pounds per Square Inch			Moment, Lb-In.	Stress, Lb per Sq In.
1	0.156	50	160	69	45	300
1½	0.172	50	218	95	105	300
2	0.172	50	290	136	165	275
3	0.203	50	370	164	390	250
4	0.265	35	264	130	780	225
6	0.328	20	183	100	200	1,800

MATERIAL COSTS PER FOOT OF GLASS PIPING

Pipe Size, Inches	Material Costs, Dollars per Foot*	
	Simple Layouts	Complex Layouts
1	1.75	3.00
1½	2.60	4.00
2	3.25	5.25
3	6.50	7.75
4	8.00	13.00
6	14.00	20.00

*These costs include straight sections, fittings, metal flanges, gaskets, all without spares.

COMPARATIVE COSTS OF PIPE LINES

Material	Relative Cost, %	
	Installed[a]	Material Only[b]
Glass (Pyrex Piping)	100[a]	100
Lead (pure, no supports)	93	.....
Porcelain	190	102
Hard rubber	.....	129
Stainless steel		
No. 304 Zephyr wt. welded	120	.....
No. 316 Zephyr wt. welded	176	.....
No. 316 or 347 Std. wt.— Screwed	460	.....
Rubber-lined steel	160	129 to 143
Saran-lined steel	.....	174 to 194
Glass-lined steel	.....	280
Duriron	290	.....

the flange faces into alignment during installation, or from relative shifts between the pipe line and supporting structures during operation, as a result of temperature changes, restraint of hangers and clamps.

(3) Tensile stresses resulting from inexact length fit of pipe sections during installation, or relative shifts in operation.

(4) Bending and sheer stresses resulting from the weight of the pipe and fluid between supports.

(5) Miscellaneous stresses which may be superimposed on the other stresses, and which may result from water hammer, vibration, surging and inertia forces caused by the closing of a valve.

Glass piping is normally used for fluids at temperatures up to 250F, but higher temperatures are practicable when thermal insulation is used to reduce the thermal gradient through the wall section of the pipe. Service experience has shown that when the fluid in a glass pipe is at a temperature of 250F, with an ambient air temperature on the outside of 50F, the resulting stresses are not excessive. This differential temperature of 200F may be applied up to 3-inch sizes, inclusive. For 4-inch pipe this value should be reduced to 175F and for 6-inch pipe to 160F.

From the standpoint of costs, glass is among the lowest of all corrosion resistant materials used for piping. Material costs for various sizes and also comparative costs with reference to other materials are given in the accompanying tables.

Industrial glass piping has proved itself a satisfactory solution for a wide variety of problems in the conveyance of chemicals and foods. The requirement of additional care in the installation and maintenance of this equipment has not been found to be any appreciable disadvantage in its use.

Errol B. Shand
Staff Sales Engineer,
Corning Glass Works

Corning, N. Y.

Temperature Monitor Serves 48 Remote Points

A temperature monitoring device, recently developed by M. L. Greenough, F. H. Bayhi, Jr., and Melvin Martens of the National Bureau of Standards electronic instrumentation laboratory, flashes a warning if the temperature at any one of 48 remote points rises above an individually predetermined safe value. Although the unit was developed to monitor temperature-critical points in shipboard applications, it could be used similarly in other types of installations.

From the centrally located NBS monitor unit, pairs of wires run to individual thermocouples mounted at the critical points. A master alarm light goes on if any of the 48 points become too hot, and an alarm bell will ring simultaneously if desired. The location of the trouble is shown promptly by a separate indicating unit. On the panel of this unit are 48 lights arranged in rows, each light corresponding to one of the 48 thermocouples. These lights go on to show which thermocouples (up to five) are over-temperature. The actual temperature at any single point can be measured, if desired, by plugging a meter into the appropriate circuit.

The monitor covers the range from 100 to 400F, and each circuit can be individually set to trigger the alarm at any temperature within this range. Nominal accuracy is within 4F at 100F and within 10F at 400F.

A crucial part of the NBS temperature monitor is its scanning switch. This is a mechanical assembly rotating uniformly with a 5-second period. On each revolution, one section of the switch samples each of the 48 thermocouples in turn. The thermocouple signal, after application of a voltage that automatically corrects for variations in the cold-junction temperature, passes through a pulse-forming circuit and is then amplified. The amplified pulses are fed to an alarm relay circuit consisting essentially of a thyratron. Whenever the pulse amplitude exceeds the bias on the thyratron, the tube fires, closing a self-latching relay that turns on the master alarm light, and, optionally, rings the alarm bell.

PRODUCT APPLICATIONS

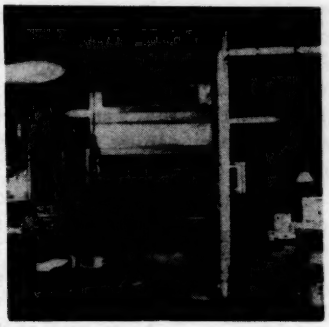
New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

Packaged Units Cool Factory

PROBLEM: The Anderson Spring Co. of Cleveland decided to install air conditioning intended primarily for the comfort of factory employees. This is the first comfort cooling job that was sold to a factory in that area exclusively for employee comfort. The original estimate of the load came to nearly 50 tons.

SOLUTION: By utilizing condenser waste water as a roof spray, the cooling load was reduced to 40 tons. Two Typhoon 20-ton packaged units were installed directly in the conditioned area without the use of duct work. Offices are cooled by tying a 5-ton unit into existing heating ducts with minor changes in duct size and grilles to accommodate the distribution system for cold air.



RESULTS: By use of packaged units, the time required for installation was less than three weeks from date the contract was signed. Employee efficiency and morale were improved.

Eleven Zoned System Uses Packaged Units

PROBLEM: At the main office of the National Sugar Refining Co., in Long Island City, N. Y., a 65-ton air conditioning system with eleven zones was part of a remodelling program which will transform a 50-year-old former garage and office building into a modern plant office. The 2-story building will contain the sugar company's management, engineering and architectural offices, as well as the plant office and laboratory.

SOLUTION: A 25-ton refrigerated Kooler-aire unit, manufactured by U. S. Air Conditioning Corp., will serve the first floor where there will be five zones of reheat, and a 40-ton unit will serve the upper floor where six reheaters will be fed by low pressure steam from the main plant building. Pneumatic controls and automatic air filters are included in the design of the system. Air distribution will be through square ceiling outlets, designed to blend with the acoustical block design of the ceiling. Special direct current motors were installed in the equipment which operates from the plant's own generator.

RESULTS: Original plans for air conditioning the old building called for installation of a chilled water central plant system, but the packaged units were finally adopted because their use eliminated the basement space requirement for compressors and the need for a roof cooling tower. The packaged units contain built-in evaporative condensers which conserve cooling water.

Exhaust Fan Picks Up Leaves

PROBLEM: An ordinance in the town of Lexington, Va., prohibits outside fires including those of the autumn clean-up variety. Disposal of leaves raked up from lawns in the fall created a serious street cleaning problem.

SOLUTION: The town manager and a town employee constructed an apparatus combining an old stovepipe, a Westinghouse Sturtevant fan, a gas engine, and an old trailer. The fan, a size 45 planing mill exhauster, is belt-driven by a gasoline engine, and its intake is connected to a 12-inch stovepipe. The open end of the stovepipe is fixed in a position about 12 inches above the ground. A second stovepipe is attached to the fan outlet and forms a duct opening into a truck body.

RESULTS: Lawn owners rake the leaves into the street and this contraption picks them up like a vacuum cleaner and bales them.

Massive D. C. Building Air Conditioned

PROBLEM: In order to comfort condition the U. S. Chamber of Commerce Building, Washington, D. C., it was necessary to design for a varying occupancy of 600 to 2200 persons with a fluctuating load depending on frequent use of meeting rooms and auditoriums. In Washington, D. C., high moisture predominates even when temperatures are relatively low. The 25-year-old building containing a million cubic feet is of monumental construction and the interior of the building was not to be altered to accommodate air conditioning.

SOLUTION: In order to handle moisture load, independent control of humidity and temperature was specified. Temperature is controlled by individuals in offices and is automatically controlled in meeting rooms. A separate air drying system is served by three dehumidifiers from which air is distributed to each room in the building through a high velocity duct system of aluminum tubing. In the system, designed by Thomas H. Urdahl, heating and cooling are by means of separate systems applied to individual units serving individual offices and meeting rooms. Chilled water is supplied from a 240-ton refrigerating plant. Ceiling and floor air conditioning units, the remote room air conditioners, and coils were supplied by Marlo Coil Co.

RESULTS: Both supply and independent control of temperature and humidity for maximum comfort in a new climate were installed in an old building with complete flexibility under varying load.

Power Tool Speeds Plumbing Installation

PROBLEM: At the new student Union Building on the Ohio State University campus, as part of the University's $28-million expansion program, plumbing fixture racks were installed and anchored to a 2-inch rough concrete slab. The slab was not thick enough to hold anchor bolts and the only other conventional way to fasten the racks would have been to drill holes through the slab and use bolts and nuts. It would have taken at least 10 or 15 minutes to position each rack, mark the floor, remove the rack, drill through the concrete, and then bolt the pipe carrier in place.

SOLUTION: By using a power actuated driving tool, supplied by the Velocity-Power Tool Co., workmen were able to install plumbing fixture racks in 1/5 the time the conventional job would have taken. The MSA Velocity-Power Driver can drive threaded or headed studs into concrete, wood or steel using the energy created by the discharge of a blank cartridge. Once the fixture rack was properly aligned the threaded 3/8-inch stud was driven solidly into the floor through the bolt hole without moving the fixture. Then a nut was tightened down on the threaded end of the stud.

RESULTS: Installation of about 90 self-supporting plumbing fixture racks, as well as other jobs in the building, required less time than conventional methods.

Radio Tubes Cooled by Evaporator

PROBLEM: In transmitting stations of the Voice of America, transmitting tubes are used which require chilled water to be passed through a jacket surrounding each tube. This enables the tube designer to make a smaller, more compact tube, lending itself better to short wave transmission.

SOLUTION: Water for tube cooling jackets is cooled by a special Trane evaporative cooler designed to bring 69 gallons per minute of water from 140F down to 125F, with air entering the cooler at 75F wet bulb. The tube cooling water is passed through a copper coil within the evaporative cooler where water is sprayed over the coil. At the same time, air is blown through the water spray which is cooled by evaporation. Radio tubes are manufactured by Machlett Laboratories, Inc., of Springdale, Conn., where Trane coolers are also used to cool water for tubes under test.

RESULTS: An economical radio tube design is made possible by mechanical cooling equipment.

Home Community Air Conditioned

PROBLEM: Charles A. Newbergh, president of Heathcote Heights Building Corp., approved a plan to install year round air conditioning for all homes in a new residential community, Heathcote Heights, New Rochelle, N. Y. The community will have 75 homes, the first of which is now under construction. All will be built to sell for $40,000 and up.

SOLUTION: The Carrier residential Weathermaker was specified and an order for 50 units was placed through the Thermodyne Corp., New York distributors. The units will provide refrigerated air in summer and filtered warm air in the winter. Operating on any type gas, the unit can be changed from cooling to heating by the flick of a switch. Both colonial and ranch type homes are being designed for the project by Lee Perry, New Rochelle architect.

RESULTS: Homes are freed from window and layout problems since it will be unnecessary to consider cross ventilation or plot orientation in the house design. All windows will be kept closed throughout the year and the problem of screens, storm windows, and attic fans will be eliminated.

Army Needs Constant Temperature Vans

PROBLEM: For vans housing electronic equipment which delivers top performance within a narrow temperature range, the Army wanted a new type air conditioning system. Specifications called for a unit capable of operating with outside temperatures ranging from —65F to 125F, as well as the ability to remain in top working condition after being stored for long periods of time at temperatures as low as —80F.

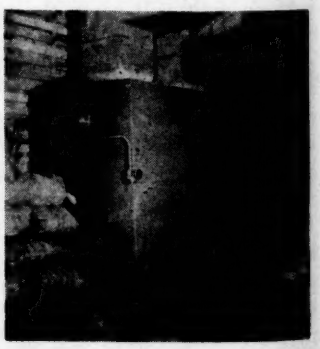
SOLUTION: U. S. Thermo Control Co., Minneapolis, developed a special unit powered by a gasoline engine and weighing about 1,400 lbs. The unit is capable of controlling the temperature in a van of 1500 cubic feet. It was installed in the upper leading edge of the van. For extremely cold weather operation, the entire unit is covered by a hood. During hot weather operation, a system of shutters and dampers keeps heat out of the cooling cycle.

RESULTS: The van has been completed and shipped to the Army Corps of Engineers at Fort Belvoir, Va., for testing. Operation of electronic equipment and comfort of personnel will be assured anywhere in the world.

Air Conditioned Storage Holds Potato Crops

PROBLEM: In the San Luis Valley in Colorado, the Red McClure potato as it comes from the field is a premium potato but it keeps its fine quality only when stored at just the right conditions of temperature and humidity.

SOLUTION: Ray Metz, six miles northwest of Monte Vista, is a pioneer in big scale potato storage. Two years ago he built a 150-foot x 50 foot building of lightweight pumice concrete blocks. Glass wool insulation covers the ceiling and fills space between double walls. A Marlo industrial type unit cooler provides refrigeration for complete air conditioning.



RESULTS: The first season Metz stored 22,000 sacks of potatoes and received one dollar a sack higher than market price between October and May.

Experience is my Classroom

By T. W. REYNOLDS

• HOUSE WITHOUT AN INSIDE HEATING SYSTEM

Indoor space costs so much more than outdoor space. Why then should a furnace or any part of a heating system be installed inside? Why not clean house by shoving the gas or oil furnace outdoors and hide it there in a wrapping of cinder block, well insulated. This simple and dollar-saving back yard lean-to can have an economy size modern slim line furnace, so efficient that the lean-to need be but a veritable dog house in size, although still kept neat of appearance as in Fig. 1. The floor slab or joists can then have the warm air pipes, since no one wants to see them any more.

This economical relegation of the heating plant to an area adjacent to the house is all so necessary as a means for keeping down costs. Because of costs, the number of houses without basements must greatly increase. This in turn calls for a re-study of house planning for this type of house. Aside from these considerations, people have learned that comfortable and economical heat can be obtained without visible and annoying means.

The suggested lean-to arrangement seems to meet the stated requirements, and may be incorporated with a small back porch. Here any noise, odors and dust will be further removed from the occupied space and made least noticeable, while concealment of heating equipment and its service and fuel supply can be most easily effected. Service lines will be shortened and kept outside while service and supply can be confined to outdoors and made at any time. No need for any one to stay home for these reasons.

The usual fireproofing as required for an indoor furnace room can be eliminated, as well as the brick chimney with its well-known fire hazard record and its demand for room space. As a result, the house and the heating system both become smaller and cost less to erect as well as to maintain.

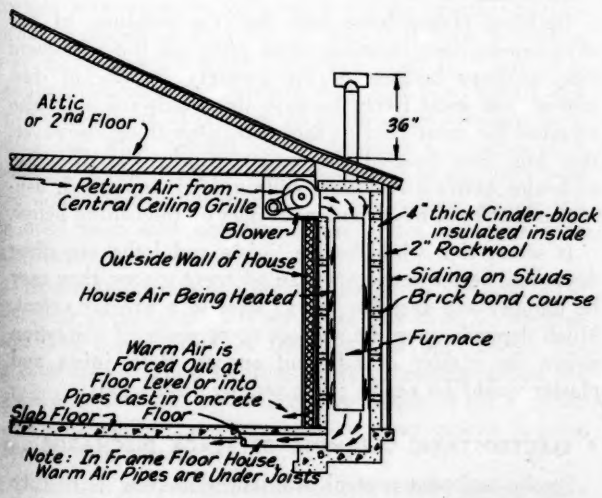


Fig. 1. Details of warm air furnace installed in an outside housing.

Interior utility space is always valuable and invariably becomes over-crowded. So many other things can be substituted for that space—a stairway, closet, laundry area, or enlargement of the living space. But whether the space is eliminated or better utilized, the house is safer without the heating plant and can be better planned by the designer. What a lot of advantages when we sum them all up!

An efficient modern furnace takes up less space and if designed as a drawn-out cylinder, as shown, requires so little area that the lean-to will cost less than the indoor brick chimney, otherwise used. The fan shown need not be inside the house and it can be arranged to filter air from indors and outdoors. Summer ventilation could also be obtained and, with suitable by-pass, the attic could be cooled when necessary. Perhaps some codes might require a fire damper at the grille to the house, as well as outdoor air opening to the furnace room.

• ELECTRIC BASEBOARD PANELS

Not long since we were discussing the practicability of baseboard heating, a method of heating now highly developed to get the most heat in the smallest space. Steam and hot water were first used as the heating medium, but of late electricity has been introduced as a third source of heat.

Although the cost of electric heating by past methods is in many cases rather expensive, comfort demands of the near future will no doubt cause it to be viewed otherwise. This may be particularly true in the case of the electric radiant heat baseboard panel, one type of which in an 8-room Canadian cottage heated the dwelling satisfactorily for about $30 during the month of March with outdoor temperatures as low as —30F. It was also found that the dwelling retained its heat for five hours after the electricity was turned off. During the same time a similar house next door with a hot water system used oil costing $53.

Obviously, electric heating costs much less to install since it avoids the use of a boiler with firing device, smoke-pipe, chimney and fuel storage. Absence of these things reduces cost of structure or makes space available for other purposes. Its further appeal is the elimination of pipes, pipe covering, vent and radiator valves. Maintenance is greatly reduced while stand-by losses and heat losses from piping are eliminated altogether.

Electric heating is quiet, neat-appearing, odorless, fumeless, sootless and dustless. There are no pipes to corrode and nothing to vent, freeze, initially fill or empty. In operation heating is quick, especially as pick up is

negligible. The method gives ease of regulation with panels subject to individual thermostatic control. In new installations panels are set within studs and conversion jobs offer no problem. It was 30 years ago that Dr. Brabbee advocated heating at knee height for both comfort and economy and this is exactly what the baseboard panel achieves.

There appears to be only two manufacturers of electric baseboard panels at this writing. The Continental Radiant Glass Heating Corp., New York, uses tempered glass panels sprayed with molten aluminum. The glass is mounted in an aluminum reflector which reflects back heat otherwise lost through the wall. Infra-red rays produce the heat. In about 2½ years, to March, 1951, they have sold 160,000 panels at a gross of about $1,000,000.

The Appleman Art Glass Works, Bergenfield, N. J., has developed a panel called Electriglas. By March, 1951, they had sold, in about 2 years, 100,000 panels at a gross of about $1,000,000. Their panel contains a chemical element fused into the back surface of the glass. The surface temperature of this glass is about 240F. One unit (1,024 Btu) is 42 inches long; the other unit (683 Btu) is 30 inches long. Unit is only 6½ inches high and only 1¼ inches deep.

• SMUDGE MARKS

Smudge is one of those things commonly thought of as due to electrical potential, or some other mysterious cause. Thus, we observe its mark on a particular ceiling with one make or type of air outlet, yet seldom find it on some other ceiling, regardless of distance, and even though the comparable ceilings and outlets may be identical. Why is it that in some cases, smudge returns for several times after its removal, then ultimately never returns?

We have more smudge today because increasing population and industry are stirring up and making more dust. Unfortunately, this is at a time when labor costs for cleaning and decorating are high, and they may even be higher. Smudge is also becoming more of a problem because there are more air circulating systems. Most of these systems supply conditioned air, containing moisture, a factor of smudge. Another factor is that ceilings are lower which make them more subject to air movement, and they are of lighter color. Therefore, it is urgent that the cause and remedy for smudge be found.

Concentrated lampblack in the room air supply seems to be the answer. When used in a test room having a white ceiling it was shown that a type of adjustable outlet which deflects air away from ceiling, or decreases the air velocity at the ceiling, will eliminate ceiling smudge, unless the housekeeping is unreasonably poor, or the humidity very high. Even where room conditions are bad, such an outlet can be adjusted to greatly reduce the amount of smudging. In fact, the worse the room conditions are, the greater the reduction in the smudging which would otherwise take place. Obviously, keeping air away from the ceiling, also keeps dust away; lowering the air velocity at the ceiling means that there is less dust-laden air passed over the ceiling. Less secondary or dirty, unfiltered, room air is then entrained.

Over-humidification increases smudge because moisture-laden dirt is precipated out to adhere to the ceiling. Dust when wet is not so easily wiped away by the air stream as it is when dry. Newly constructed buildings with too early a use of the air conditioning system cause a great deal of smudge, not alone because of construction dust as created, but rather because the dust is soon over-humidified by evaporation from materials not yet suitably dried.

An industrial plant in New Jersey, with offices and laboratories, uses but one make of non-adjustable air outlet throughout. Strangely enough some ceilings are smudged while others are not. The reason for this difference is not hard to find if one observes that the floors of the rooms where smudging of ceilings occurs are scraped by a machine and then polished, while the non-smudged ceilings are all in rooms that have hardwood floors.

Although the correct manual field adjustment to an outlet designed for non-smudging eliminates or reduces smudging according to conditions, good housekeeping also has an important bearing on ceiling cleanliness. Room conditions should be more often blamed than the particular filter or outlet used. Much depends upon the frequency of use of the space, whether public or private, the kind of process, if any, the kind of floor and the kind of dirt. Furthermore, if a room has a high internal heat gain, it must have a high rate of air movement. Each outlet will then have to deliver more air and probably discharge it at a higher velocity.

When an air conditioning system is operated during building construction, it may be with or without filters. At other times it may be that a few sections of filters are left out. The degree of maintenance of filters may also be very poor. However, filters cannot eliminate ceiling smudge if the dust of the room is first aspirated to the cones of an air diffuser and wipes the ceiling before being returned to the filters. That is why the bottom of the cones are sometimes dirty while their tops remain clean.

Keeping dusty air away from a surface is the first thing to do to eliminate smudging. Therefore, baseboard radiation with front outlets rather than top outlets, eliminates smudge on walls. Air circulating to exposed radiators along a cold outside wall should come more readily to the dew point and therefore produce more smudge. However, sometimes it is the exposed radiator at an inner partition that sets up the most smudge.

Building management says that the windows of our skyscrapers need cleaning most often on the windward side, perhaps because of the greater quantity of dust moved, but most likely because the windward side also receives the most rain or moisture. One thing, however, that long has puzzled the writer is why the direction of beams above a residence ceiling, long unpainted, usually is disclosed by a shadow of dust on the ceiling below.

It seems that while beams, joists and laths are often dryer and better insulators than adjacent spaces, they may be damper and therefor collect dust to a greater extent. Much depends upon the absence or presence of insulation above the plaster of adjacent spaces. Both joists and plaster could be easily protected by insulation.

• ELECTROSTATIC CLEANING OF STACK DISCHARGE

Smoke and soot control ordinances in New York City and elsewhere are a spur to more rapid development of the electrostatic cleaner. In this connection, a correspon-

dent writes that the soot blower on his fire tube boiler drives the soot out of the stack to the great annoyance of the city authorities and his heretofore friendly neighbors. He would like to retain his neighbors and the stack, which is 3 ft in diameter and 90 ft high, but get rid of the soot.

Equipment that should be effective is an electrostatic unit manufactured by the Aerotec Corp., Greenwich, Conn. Perhaps there are others. This particular unit is a combination electrical collector and cyclone which could be used continuously. It operates satisfactorily, both for soot removal and reduction of smoke discharge.

Another unit however, which could be used only when blowing soot, is a Type *W*, Arrangement *A*, Roto-Clone manufactured by the American Air Filter Co., Louisville, Ky. It is a very efficient and relatively inexpensive dust collector, but it cannot be used when the boilers are under fire, since it cannot operate at temperatures above 180 to 200F. The Type *W* is a wet collector. Use of an impeller and water cone of stainless steel is recommended. Collected material could be discharged to the sewer. A damper would have to be installed in the breeching for closure when the Roto-Clone is in use. Either one of the units mentioned would be installed somewhere in the breeching between the boiler and the stack.

• TALL OFFICE BUILDING PRACTICE

The prime requisite for any new tall office building is to obtain as much useable or rentable floor space as possible, keeping also in mind that the construction business figures costs on the cubic foot basis. This must be achieved at the least cost and still meet flexibility requirements of air conditioning and other mechanical systems, plus future possible partitioning of floor areas. Mechanical systems should not be fixed as to type, but should be designed to permit open competitive bidding on other types of systems. Although this may impose quite a burden on the engineer, it will allow the owner to take advantage of the lowest figure.

It is interesting to observe the path taken during the years in an effort to provide more rentable floor area. Examples are the hanging of radiators and the use of cooling units at windows which need but slight enlargement to enclose a radiator. At one time it was the practice to fireproof as shown at *A* of Fig. 1. Now it is done in such a way as to provide space for pipes as at *B*. There is a tendency to make the columns deep and thin, see *C*, and with a minimum of furring. Space so saved does not seem large, but when totaled for all columns and floors it is substantial, particularly when converted to the high rent per square foot of floor area. In the tropics, the design is even such that concrete columns are outdoors with aluminum shutters between.

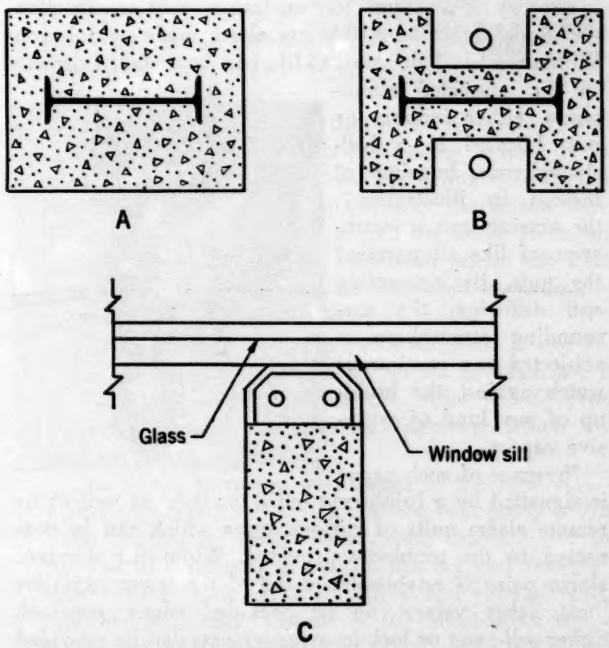
Thin columns allow glass window areas of about 50% the floor area. In the UN structure this is 56%, whereas standard construction in the past was only 25%. The greater use of glass requires more of zoning unless the glass is of the kind which keeps out much of the summer heat and retains the winter heat, or more money is spent for venetian blinds.

Although air conditioning and improved lighting make deep interiors more useable, they do require space for ducts and zoning. The tendency seems to be to have depth in offices by erecting narrow buildings with much perimeter, and consequent greater heating and cooling loads. The wind bracing required for such tall and narrow buildings requires steel beams of greater depth, nevertheless the small ducts of unit systems can pierce these beams without reducing the beam strength.

Ducts tend to become ever smaller, thus saving valuable space and something on first cost, although first cost is but 25% of the total investment for air conditioning. As duct sizes decrease, there is a tendency for more noise, and a substantial increase in power requirements. Sheet metal workmanship must then be the best to avoid undue resistance in operation. To provide less work for the fans, it is desirable that the ceiling air diffusers be selected on the basis of their ability to circulate air in a draftless pattern. This allows the use of colder air and, therefore, smaller ducts.

In the large office buildings, space is always rented without partitions. The tenant provides his own and dictates where he wants them. He may even have to build his own air conditioning system at his own expense, or be allowed a fixed sum for doing it. Ultimately, even the refrigeration per floor with all its maintenance and service may be dumped in his lap. In this way, the owner may reduce initial and operating costs and invest the money otherwise spent for chilled water lines. Even when these lines are provided the tenant may have to install his own local coolers. However, if he does, he can better suit his own shifting loads. If the wiring for units is circuited on a per floor basis for flexibility of operation, the owner can meter through the tenants sub-meter and the tenant must then absorb the cost of unit operation.

The unit type of system gives the best in zoning and has the flexibility of adding additional capacity if required. The total installed motor horse power may be greater than in a central system, but the operated horse power may be less. In a corner office, for example, there may be two or three units, but with only one running at a time.



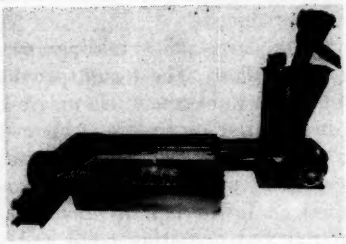
How columns have been changed to provide more space or light.

NEWS OF EQUIPMENT AND MATERIALS

Use the prepaid postcard opposite Page 120 for securing additional information on items described in this department.

Crossfeed Commercial Stoker

Development of a new commercial and light industrial automatic hard coal burner, the Motorstoker Crossfeed, has been announced by the Hershey Machine & Foundry Co., Manheim, Pa. The anthracite burner is available in capacities of either 200 or 300 lb. of coal per hour.



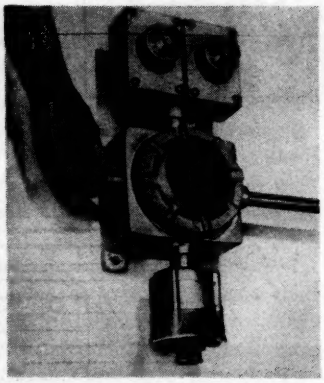
All moving parts are outside of the boiler away from the high temperature zone. Feed-rate adjustments are made from the outside of the unit without disturbing the fire. Operating power requirements are low. A positive over-load release protects the unit from damage. The stoker can be mounted on either side of the boiler, in single or double installations, and equipped for either bin or hopper feeding. In most cases no expensive boiler alterations are required and, because of its compact design, the front of the boiler is kept clear for easy boiler cleaning.

It has been approved by the Anthracite Institute.

For more information, circle on Inquiry Card, **Item 1**

Combustible Gas Alarm

Because of its completely explosion-proof construction, the Model EE combustible gas alarm made by Johnson-Williams Ltd., Palo Alto, Calif., can be installed directly in the suspected atmosphere, either indoors or out. Located in a bell-shaped cover housing (at bottom in illustration), the sensing unit is weather-proof like all parts of the unit. By convection and diffusion, the surrounding atmosphere is subjected to a continuous watch against the build-up of any kind of explosive vapors.



Presence of such vapor is signalled by a bright red indicator light as well as by remote alarm units of various types which can be connected to the terminals provided. While the standard alarm point is established at 0.2 of the lower explosive limit, other valves can be provided where required. Either self-reset or lock-in arrangements can be provided to give a choice between an on-off indication of gas, or one which must be manually reset. The sensing unit can be located remotely from the rest of the alarm if desired.

The alarm is designed for rough-service locations. It contains no meters, but utilizes an electronic trigger-tube circuit to convert the sensing-unit signals into alarm indications.

Features of the alarm make it applicable to pipeline pumping stations, liquefied-petroleum gas plants, and industrial and commercial areas where gas or volatile liquids are used, stored, or handled. Unattended stations are particularly indicated.

For more information, circle on Inquiry Card, **Item 2**

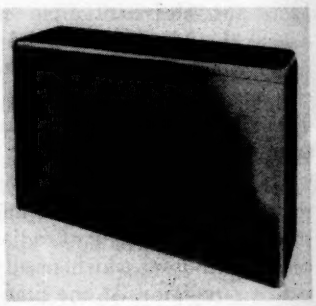
Anti-Rust Paint Dries Fast

An improved formula of its rust inhibitor No. 425 is announced by United Laboratories, Inc., Cleveland, Ohio. Features of this rust preventative paint are that it will dry in 10 minutes under normal drying conditions and one coat provides excellent hiding of the old metal surface. It will withstand temperatures from minus 100 to plus 250 deg. and is exceptionally resistant to salt air and fumes.

For more information, circle on Inquiry Card, **Item 3**

New Models Fan-Type Convector

Three new models of Force-Flo heaters, forced convection cabinets, built by The Trane Co., La Crosse, Wis., have been introduced to increase the variety of applications and to complete the six-unit line. All models have been streamlined in design to simplify maintenance. The units are designed to heat lobbies, entrances, showrooms, bowling alleys, recreation rooms, foyers, schoolrooms, churches and other locations requiring a high volume of heat from an attractive source.



The new models comprise a free-standing unit, Type FG; a semi-recessed design, Type SG, and a completely recessed cabinet, Type RG. All three models have front inlet and front outlet grilles designed for blanketing doorways or other areas where air must be discharged horizontally from the unit.

Design improvements include a cabinet front removable by loosening two quick-acting cam locks, grilles that are integral parts of the cabinets, and a new headering system that permits concealed piping in any position, including ceiling mounting.

Twin centrifugal fans, pushing air out over fin and tube heating coils, enable the Force-Flo heaters to block cold drafts and raise room temperatures quickly. All units, whether floor, ceiling, or wall-hung, can be installed in either steam or hot water systems, with capacities up to 105,000 Btu.

For more information, circle on Inquiry Card, **Item 4**

Oil Heater for Large Trailers

A new, oil-fired trailer heater, compactly designed for installation in large mobile dwellings and engineered to provide even forced warm air heating comfort, is announced by the Duo-Therm Div., Motor Wheel Corp., Lansing, Mich. Called the Model 530, it has an output of 27,000 Btu per hour.

Equipped with the Dual-Chamber burner and automatic built-in power-air blower, the heater is recommended for trailerites seeking a larger-capacity heating system for larger coaches. It features compactness, being but four feet high, with a depth of 14 inches and a width of 22 inches.

The heater is expressly designed to counteract the problem of condensation from high humidity which exists in trailers because of their tight construction and kindred factors. Outside air at low humidity is induced at the base of the new heater and mixed with heated air for tempered air circulation.

Advantages include large-volume heat output, uniform forced warm air distribution, high efficiency and economical operation. It is easily adaptable to heating designs of all major trailer manufacturers because it accommodates under-floor, over-floor or combination systems. Optional equipment for automatic control is a conversion kit containing a wall thermostat and an electric "auto-heat" top for mounting on the heater's oil control.

Provision has been made for connecting heat ducts in a variety of ways. An arrangement can be employed for using the registers in the base of the unit to heat the living and adjoining rooms and relaying heat to the rear bedroom. For the latter application, there is a duct connection in the base of the heater for use with four-inch stovepipe. The pipe can be run to the rear of the coach without any additional fittings or sharp turns, insuring delivery of the maximum amount of heat to the back bedroom. A two-piece conventional register for installation in the bedroom is standard equipment with the heater.

For adaptation to under-floor duct systems, a five-inch knock-out is provided in the base of the unit. In this type installation, use of registers in the unit is optional.

For more information, circle on Inquiry Card, **Item 5**

Filters Withstand 550 Degrees

Outstanding economies in bag-house operations where high temperature dust-control systems are required are being effected through the use of Silicone-impregnated glass cloth filter bags, which have a temperature range up to 550 deg., are available from Menardi & Co., El Segundo, Calif.

The new Maco fabric is one of the developments in the research program conducted in Los Angeles County in a community-wide effort to control smog.

By experimenting with glass cloth to replace the wool and cotton bag filters generally in use, the makers developed the process of silicone-impregnating glass cloth, so that while retaining the natural high heat-and-corrosive resistance of the original fabric they produced a new fabric, smooth and silk-like in texture and durably flexible.

In tests of the fabric, the Air Pollution Control Commission announced that it was 90% effective in the filtration of gases having in excess of 40% submicron particulate at temperatures up to 550 deg.

The discovery of Maco practically doubles the heat range that can be effectively handled by bag filters, and materially reduces the amount of costly heat-control equipment required in the dust-control system.

For more information, circle on Inquiry Card, **Item 6**

3 and 5 hp. Heat Pumps

The first shipment of its new packaged heat pump, a year-round all electric air conditioning unit, is announced by General Electric Co., Air Conditioning Div., Bloomfield, N. J. The device is being placed on the market after more than fifteen years of development and field testing of this unusual type of heating and cooling unit. Principal market for the product is expected to be in new homes, stores and officers, with or without basements.

The heat pump operates on the same principle as an electric refrigerator except that the cycle is reversed to provide heat instead of refrigeration when heat is required. If differs from other heat pump designs in that it is a complete air-to-air unit that uses the outside air as a source of heat. It automatically provides heating, cooling, dehumidification and ventilation in all seasons. At a specific thermostat setting, the device will either heat or cool the home as required by indoor conditions. The equipment senses the change in weather conditions and adjusts itself accordingly to provide ideal indoor climate.

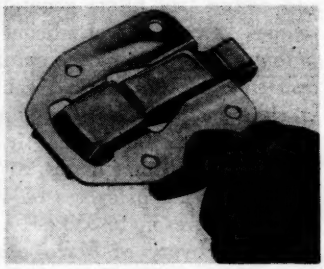
The heat pump is being made in both 3 and 5 hp sizes. The company states that, on the average, the cost of operation will be about the same as its present individual heating and cooling equipment which would perform the same functions.

One of the principal advantages of the new unit, the maker points out, is the fact that the heat pump provides home heating by electricity at approximately one third the cost of conventional electric heating and relieves the user entirely from all fuel supply and storage worries. Another important feature is the elimination of soot, ashes and chimneys.

For more information, circle on Inquiry Card, **Item 7**

Flush Latch for Access Doors

Designated as part No. H-5150, a new flush latch, for heavy duty access panels and inspection doors, is introduced by Hartwell Co., Los Angeles, Calif.



The bolt contains a spring loaded button that allows for variations in closure contact and misalignment which insures tight closure of access panels and doors. The latch opens only when a substantial direct pressure is applied to the latch; this guards against inadvertent releasing of the latch due to light loads and vibration. The operating trigger is large enough to make the latch easy to open even when operator is wearing gloves.

The new latch is made of heavy gage stainless, coated cold rolled steel or heat treated aluminum in many combinations of trigger and bolt offsets, assuring a flush surface through a wide range of material thicknesses.

For more information, circle on Inquiry Card, **Item 8**

Anti-Rust Stainless Coating

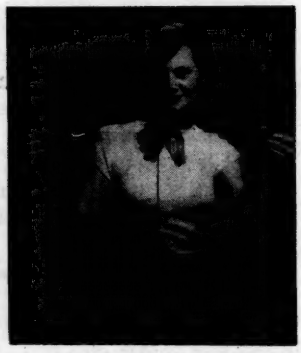
A protective coating, consisting of flakes of actual stainless steel reduced by a new process to a microscopically fine form and combined with vinyl plastics to form a quick drying liquid has been introduced by Slip-On Inc., New York, N. Y.

The coating gives a surface of stainless steel to protect against rust and corrosion. Metals, wood, composition board, concrete and brick can be given much of the permanence of the metal itself. The steel can be sprayed, brushed or dipped. A bulletin is available.

For more information, circle on Inquiry Card, **Item 9**

Heat Absorbing Window Glass

A greenish tint glass called Solex which absorbs the sun's heat, reduces eyestrain and keeps fading and bleaching of fabrics to a minimum is announced by Pittsburgh Plate Glass Co., Pittsburgh, Pa.



The new glass absorbs the red portion of the solar spectrum so that the light transmitted through it is the easier portion on the eyes. While it absorbs most of the solar infrared and untraviolet rays, at the same time it transmits adequate soft daylight for clear visibility (see right portion of photo).

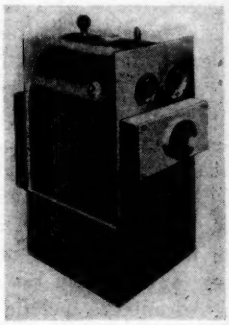
A room glazed with this glass is said to be from 10 to 20 deg. cooler than a room with windows of ordinary glass. The use of the product in window openings which have direct solar exposure results in materially reducing the load requirements on air conditioning equipment. In addition, the glass tends to produce greater eye comfort for the people in the room. The pleasant greenish tint softens light intensity and thus reduces glare.

The new glass also has many advantages for show window glazing. Where perishables are displayed it prevents deterioration because of its heat-absorbing qualities. It reduces the possibility of colored fabrics fading or bleaching by excluding a large percentage of ultraviolet rays.

For more information, circle on Inquiry Card, **Item 10**

Two-Temperature Water Heater

A water heater for restaurants, automatic laundries, apartment houses, hospitals, and hotels, etc., and which delivers 300 to 1500 gallons of hot water per hour, omitting the need of a separate storage tank, has been placed on the market by Portmar Boiler Co., Inc., Brooklyn, N. Y.



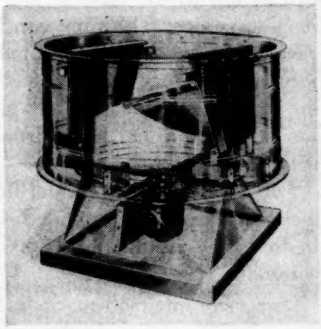
Capacities are rated at 100 degrees temperature rise with boiler temperature at 180 degrees. A feature is the twin coils which deliver dual temperatures of instantaneous hot water. When two temperatures of water are required, such as are involved where sterilizing or dishwashing, which calls for 180 degrees water, the heater supplies both temperatures from the same unit. Temperatures of 227 degrees are maintained.

The unit is fully automatic and is fired by gas or oil for domestic, commercial and industrial use.

For more information, circle on Inquiry Card, **Item 11**

Power Type Roof Ventilator

Designed particularly for rapid localized removal of air contaminated with smoke, fumes, dust and heat, the Burt free exhaust fan ventilator, claimed to provide higher capacities than conventional types, is introduced by Burt Mfg. Co., Akron, Ohio.



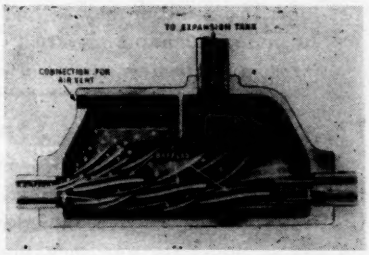
The unit is powered by an axial flow fan direct connected to its motor. Air shaft extends above the fan and terminates in a pair of dampers that open and close automatically as the fan is turned on and off. The absolute free opening allows an unrestricted volume of air to be driven vertically upward at high velocity by the axial flow fan.

Seven sizes, with motors from 1/3 to 5 hp., provide capacities ranging from 5000 to 75,550 cfm. Standard construction is in prime galvanized steel sheets but other metals may be used.

For more information, circle on Inquiry Card, **Item 12**

Hot Water Air Eliminator

The Air-Scoop, a fitting for removing air from hot water heating systems, has been placed on the market by Taco Heaters, Inc., Providence, R. I.



Since heated water liberates air, and since air is lighter than water, it will tend to travel along the upper portion of a horizontal pipe. As the air and water enter the scoop, air bubbles are scooped up by the first baffle and rise into the upper chambers. Any air bubbles that get through the first baffle are scooped up by the second or third.

Air that accumulates in Chamber 1 is removed from the system by the air valve. Air from Chamber 2 passes into the expansion tank to act as an air cushion. Should the air completely fill the expansion tank and back down into the scoop, the excess will be removed by the air valve without disturbing the operation of the system.

The device is low priced, simple to install and cast in one piece. It requires no adjusting or re-draining of system after installing.

For more information, circle on Inquiry Card, **Item 13**

High Velocity Metal Filter

Announcement is made of a new high velocity air filter, the Airsan Viro-Crimp, by Air Filter Corp., Milwaukee, Wis. It will operate at face velocities of 300 to 500 ft per min at minimum resistance and high efficiency.

The filter core (illustrated) is of the viscous type, constructed of horizontal layers of galvanized wire mesh so arranged as to assure a large filter area with no appreciable pressure drop. It is so arranged as to have no direct opening in the media, assuring efficiency, dust holding capacity and uniform loading. Because of the crimp feature, the air flows into divided channels being baffled by a filter wall. There is no specific velocity within its range at which it must operate for maximum efficiency.

A safety feature is that the edges are hemmed, providing a smooth surface and allowing easy handling for servicing.

The filters are easily cleanable. Drain slots are provided to hasten drying and aid in cleaning.

For more information, circle on Inquiry Card, **Item 14**

Line Type Purifier

Another in the series of Hi-eF purifiers developed by V. D. Anderson Co., Cleveland, Ohio, is the line type purifier for installation on compressed air, gas, vapor and steam lines.

This device has many applications throughout the chemical, petroleum and metal working industries. Chief of these are (1) to remove guck and entrained solids from exhaust steam installations. Troublesome guck fouls automatic regulating equipment causing additional maintenance, reduced heating efficiency and down time. Guck, when vented, damages plant equipment and creates a public nuisance over neighboring areas; (2) removal of condensate from compressed air lines; (3) delivery of clean, dry steam for food processing; (4) to prevent process gas and air lines from becoming contaminated with line scale and liquids, and (5) to remove entrainment from vapor lines following evaporation.

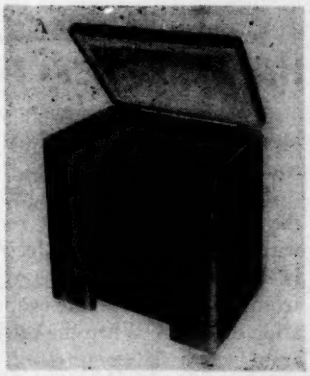
Advantages for the unit claimed by the manufacturer other than low initial cost are no moving parts and the self-cleaning action which eliminates the need for maintenance, good design which reduces pressure drop to a minimum, large slug capacities and broad range of capacities.

Bulletin 200 for sizes 2½ through 24 inches and Bulletin 500 for sizes ½ through 2 inches are available.

For more information, circle on Inquiry Card, **Item 15**

Sub-Zero Process Cabinets

A new sub-zero chest which maintains temperatures to 95 deg. below zero, is announced by Revco, Inc. Deerfield, Mich. This equipment is intended for industrial processing and laboratory applications, including shrink fits, seasoning of gages, and precision tools, and for testing metals and materials at sub-zero temperature.



The cabinet is available in two sizes, and is equipped with a Sub-lid (see photo) to maintain constant temperature throughout the storage compartment and to minimize heat loss during usage.

The all-steel welded construction is sealed air and water tight inside and out for long dependable service. The chests are equipped with high density, thick, non-setting Fiberglas bats which provide high insulating efficiency. There are two models, a 1.5 and a 6.5 cu. ft. sizes.

For more information, circle on Inquiry Card, **Item 16**

Paint Stands High Temperatures

A new maintenance paint called Thermalite that protects metals subjected to temperatures in the range of 200 to 1,000 deg., has been developed by Tropical Paint and Oil Company, Cleveland, Ohio. Specific high-temperature applications include boilers, kilns, exhaust stacks, furnaces, melting pots, refinery equipment and laboratory apparatus.

It is a high-heat aluminum paint that presents a clean, smooth, silver-bright finish, combining good appearance with high heat resistance.

For more information, circle on Inquiry Card, **Item 17**

Medium Range Cooling Tower

The Double-Flow Aquatower, a water cooling tower for use wherever intermediate capacities of cold water are required, is announced by The Marley Co., Inc., Kansas City, Mo. Cooling towers in this range are widely used in the power, Petroleum, gas, chemical processing, food processing, and metalworking industries, and wherever air conditioning and refrigeration are used. The new tower combines the efficiency of the Double-Flow design with the compact simplicity of the Aquatower.

Features of the new tower include its height (only 7½ ft. for the 150-ton unit), which is lower than that of any other cooling tower of similar capacity; low pumping head and required fan horsepower; tower weight is evenly distributed over a wide area, and the tower design simplifies maintenance and inspection.

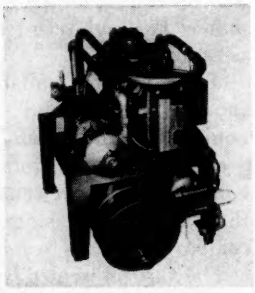
The tower comes in seven standard sizes, starting with a 50-ton unit. It is available in all steel or wood with asbestos cement board casing.

For more information, circle on Inquiry Card, **Item 18**

Home Size Heat Pump

A heat pump for year-round air conditioning for the home has been developed by Acme Industries, Inc., Jackson, Mich.

The units are placed in either the basement or utility room with pipes leading outside. Air is drawn in and heat absorbed from the air through the evaporation of Freon. When the refrigerant vapor is compressed, it releases heat which is circulated through the house.



For summer operation, the cycle is reversed, by a completely automative valve. The electrically-powered Flow-Temp heat pump then takes heat and moisture out of the inside air and discharges it outdoors.

The chief advantage to the home-owner is the year-round air conditioning that is produced. In addition, there is no soot, grime or dust from combustion. The maker is producing several sizes of heat pumps from 2 to 15 hp capacity.

For more information, circle on Inquiry Card, **Item 19**

Low Cost Aluminum Tubing

A new aluminum product, Alcoa Utilitube, suitable for a variety of industrial uses, is introduced by Aluminum Company of America, Pittsburgh, Pa. It is a general purpose aluminum coiled tube made of aluminum alloy B50S-0. It combines low cost per foot, easy workability and high fatigue strength among other advantages.

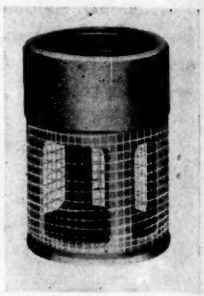
This tubing can be used in fuel oil, gasoline and lubricating oil lines for internal combustion engines or in fuel gas lines for stoves and heaters. It will also handle kerosene or refrigerants with the exception of methyl chloride.

The tubing costs substantially less per foot than copper tube. If desired, it may be had in lengths up to 1,000 feet or more, depending on size.

For more information, circle on Inquiry Card, **Item 20**

1 in. Suction Line Strainer

A 1½ inch suction line strainer that will fit a 2-inch tank opening has been introduced by Universal Valve Co., Elizabeth, N. J. It is intended for use in pump suction lines, and is so designed that the liquid must enter from the sides instead of the bottom. This feature does not trap water and keeps the line free from foreign matter and sediment while permitting maximum flow.



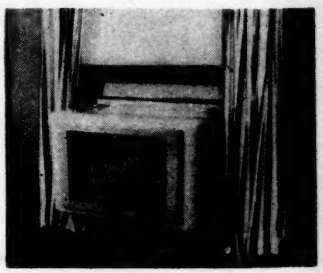
Known as the 611G, the new suction line strainer is said to reduce repair costs by enabling the use of a 2-inch tank opening. On existing installations where volatile compounds have been used, it will eliminate the danger of an explosion set off by sparks caused when chipping out existing bushing. It can also be used in new installations for any size opening 2 inches or larger.

The body is made of galvanized iron; screen is 8 mesh; outside diameter fits 2 inch opening and is threaded for 2½ inch pipe thread. The strainer can also be made in other materials, meshes, and sizes.

For more information, circle on Inquiry Card, **Item 21**

Three Room Coolers, New Line

Three models, constituting the first line of home air-conditioners to be offered by Radio Corporation of America, Camden, N. J., are announced, the three models designed for rooms, of various sizes, with floor areas ranging up to 485 square feet. Suggested retail list prices are as follows: Model 33 (up to 230 square feet), $249.50; Model 50 (up to 325 square feet), $349.50; Model 75 (up to 485 square feet), $399.50 (see illustration). They are finished in two colors, the cabinets in polar beige, and the grilles in artic tan.



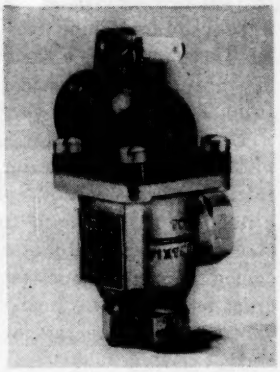
Compressors are hermetically sealed and spring-mounted. All models are equipped with adjustable grilles.

Model 33, with a ⅓ hp. motor, has a capacity of 4,200 Btu per hour and an air-discharge velocity of 470 fpm. Model 50, ½ hp., has a capacity of 6,100 Btu per hour and an air-discharge velocity of 560 fpm. Model 75, ¾ hp., has a capacity of 8,100 Btu per hour and an air-discharge velocity rate adjustable from 510 to 700 fpm.

For more information, circle on Inquiry Card, **Item 22**

New Hot Water Relief Valve

A new temperature relief valve, of the automatic reseating type, designed to prevent excessive water temperatures in hot water tanks and heaters, is announced by McDonnell & Miller, Inc., Chicago, Ill. Identified as No. 201, it has been tested, rated and listed by AGA for heat input up to 1,200,000 Btu per hr.



Operating heart of the valve is the Vernatherm thermostatic element adapted for this service. This is a hermetically sealed element, containing a chemical mixture of organic and metallic particles, which expand and contract in response to variations in temperature. The internal forces created by these temperature changes serve to open and close the valve orifice. The valve starts to open at 188 deg., and reaches its maximum capacity at 208 deg.

Operating characteristics of this element include high accuracy, durability and uniform expansion throughout the designed operating range. It reseats itself automatically, and closes off quickly at just a few degrees below the opening temperature to avoid hot water waste; exhaustive tests indicate the thermostatic element will close the valve drip tight by the time temperature drops to 183 deg.

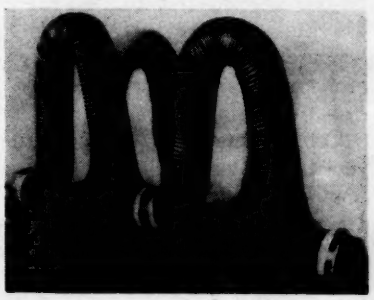
The location of this thermostatic element is another feature. By adding a fixture connection, in addition to the inlet and drain connections, the service flow can be made to pass around the element with every demand for hot water. This assures more rapid and uniform transmission of temperature variations; reduces the lag in temperature between the water in the tank and the actuating part of the valve; eliminates any air pocket at the valve; and serves to flush out the valve mechanism constantly so as to maintain peak operating efficiency.

This valve is suitable for operating pressures up to 125 lb. All three connections for inlet, drain and flow to fixtures are ¾ inch tappings. Shipping weight is 3 lb.

For more information, circle on Inquiry Card, **Item 23**

Flexible Ventilating Ducts

A durable flexible ducting for air conditioning and ventilating is being produced by Flexible Tubing Corp., Guilford, Conn., under the trade name Flexflyte. Rugged and bendable, it can be snaked through existing floors and walls as easily as BX cable. In homes and larger buildings where air-conditioning or ventilating systems are to be installed, it can be put into place with a minimum of constructional alterations.



Consisting of a fiber glass fabric cemented to a continuous steel spring wire helix, bound with glass-fiber cord, and finally bonded together with a special elastomeric compound, the ducting can be cut to any desired length with simple tools. Because of its construction, it is not only flameproof, but is resistant to both fungus and mildew.

For more information, circle on Inquiry Card, **Item 24**

Copper Water Tube in Cartons

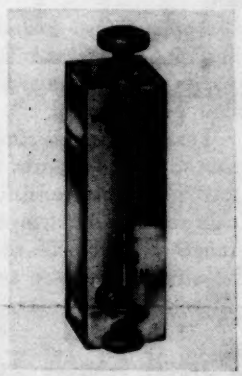
A new carton for its copper water tube to make shipping, storage and identification more convenient for users has been adopted by Chase Brass & Copper Co., Waterbury, Conn. Depending upon the size of the tube, the sturdy new carton holds from two to five 60-foot lengths of soft temper copper water tube, thus reducing carton disposal problems. A full carton is easily carried by one man.

Designed by the Chase advertising department, the new carton incorporates advantages of efficiency-engineered packaging and replaces the practice of crating coils of tube in bulk or wooden cases. The carton represents a relatively new marketing idea for heavy industry—a step toward the merchandising of brass products which permits closer identification between advertising, trademark, and product.

For more information, circle on Inquiry Card, **Item 25**

Precision Flow Meter

Eliminating inaccurate bubble counting and watch timing, a line of precision flowmeters has been introduced by F. W. Dwyer Mfg. Co., Chicago, Ill. Regardless of any change in flow rate of gas or air in laboratory test work, or when used as a replacement for sight-feed bubblers, it is only necessary for the observer to step to the meter and read the line flow.



Of solid acrylic construction, the meters are precision drilled, reamed and polished to form a sturdy, accurate, easily-read type of instrument. The standard unit includes a built-in control valve. Special scale ranges are available when ordered in productive quantities. Single units or one-piece multiple units for 0-2 cfh to 0-10 cfh at standard conditions are made for front-of-board or flush panel mounting, with mounting holes furnished to specifications.

For more information, circle on Inquiry Card, **Item 26**

1/8 hp. Vertical Dehumidifier

The 1952 Model D-182 dehumidifier made by Mitchell Mfg. Co., Chicago, Ill., may be placed easily at any point in the home or plant where moisture threatens to become a problem, according to the company.

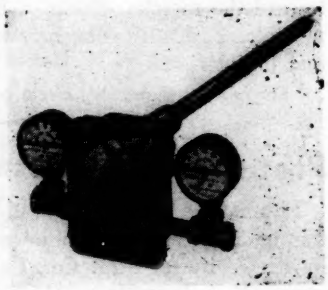
Feature of the unit is its vertical construction which allows overall measurements of only one foot square and 37⅞ inches tall. Because it is high and narrow, the dehumidifier may be easily moved without stooping and conveniently placed in the smallest space. Portability is made especially simple by use of heavy ball-bearing casters on the legs of the unit, and an integral 8 quart galvanized moisture receptacle obviates the necessity of attachment to a permanent drain. If desired, the unit can be attached to a drain hose by means of a ½ inch fitting in the bottom of the unit.

The new model is capable of removing from 17 to 25 pounds of water from 10,000 cubic feet of air in 24 hours. Heart of the unit is a ⅛ hp refrigeration compressor operating on a 60 cycle 115 volt A.C. circuit. The unit is cased by a 19 gage steel cabinet.

For more information, circle on Inquiry Card, **Item 27**

Pneumatic Type Regulator

A modern version of its Accritem temperature regulator is announced by The Powers Regulator Co., Skokie, Ill. It is an expansion stem type regulator used to maintain liquids or air at any temperature desired by controlling pneumatic or water operated diaphragm valves or dampers.



Applications include instantaneous water heaters, heat exchangers, large capacity water storage heaters, vats, dryers, dry bulb and dew point control.

Features include simple rugged construction withstands vibration and insures many years of reliable service. It has adjustable sensitivity and overheat protection and calibrated dial temperature adjustment. Temperature ranges are from 50 to 250 deg. and 150 to 350 deg. It requires compressed air or water at 15 lb. pressure.

For more information, circle on Inquiry Card, **Item 28**

Pencil Cloth Takes Erasure

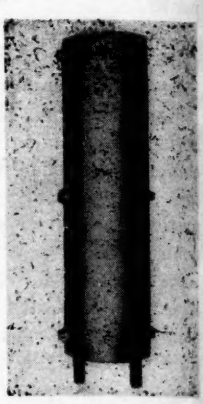
A pencil tracing cloth, Whitex Smooth, with new qualities permitting use of a liquid eradicator to remove large pencil areas cleanly, quickly and without disturbing the all important tooth of the original cloth, is announced by The Frederick Post Co., Chicago, Ill.

A special demonstration kit for on-the-spot test proof is available.

For more information, circle on Inquiry Card, **Item 29**

Multi-Purpose Heat Exchangers

A new line of units called HX-Changers for heating and cooling any combination of liquids and vapors, is introduced by Rempe Co., Chicago, Ill. These units are a shell and coil assembly having a basic rating of from 98 to 1760 Btu per hour.



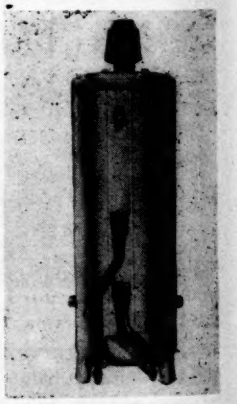
They are practical for many applications such as water cooled refrigerant condensers; converting air-cooled compressors to water-cooled service; combination water-cooled condenser-receiver; refrigerant to refrigerant heat exchangers on low temperature cascade and two-stage systems; water chiller using refrigerant as cooling medium; cooling lubricating oils using refrigerant; heating oils, chemicals, water and other liquids with steam. They incorporate a new sub-cooling feature said to promote the greatest possible heat transfer efficiency.

The units are made with a 6⅝ or 8⅝ inch shell. Body is welded construction. Coil tubes are copper on all sizes, except when made for oil treating, in which case steel coil is furnished. All steel construction is recommended for ammonia refrigerant service. Connections on shell are extra heavy steel couplings. Coil connections are IPS male thread. All units tested 350 lb pressure.

For more information, circle on Inquiry Card, **Item 30**

Large Volume Gas Water Heater

A new type hot water heater and booster has been placed on the market by Republic Heater Corp., Huntington Park, Calif.



This unit, called the Dual Super Duty Booster, is a heater with extra high recovery and is designed to be used as a circulating heater in conjunction with a hot water storage tank for large residence, multiple dwelling units, or commercial and industrial installations requiring large quantities of hot water. The unit can be readily converted to a 40 gallon high-recovery storage type heater for domestic use by operating only one of the two controls.

The advantages of this unit are its small size and its versatility. It has two Grayson Unitrol thermostats and four Econoflame burners. It has a reheating capacity of 112 gallons per hour with two controls and 56 gph with one control. It has a new type cast-iron vertical burner that equalizes heat distribution.

For more information, circle on Inquiry Card, **Item 31**

PRODUCT INFORMATION SERVICE

Use the postage-free postcards below for further information on:

- **News of Equipment and Materials**
- **New Catalogs**

Circle the Item Numbers in which you are interested and print clearly your name and address with title.

NEW CATALOGS

PACKAGED STEAM GENERATORS

A 20-page spiral-bound booklet describes and illustrates the new Foster Wheeler line of packaged steam generators with details of construction, capacity ranges from 10,000 to 26,000 lbs per hour at pressures from 250 to 825 lbs per square foot. Series AG steam generators are available with or without superheat. A section is devoted to control and instrumentation. Foster Wheeler Co., New York, N. Y. .....**Item 32**

CONDENSED CATALOG OF FULL LINE

A 36-page products Bulletin PB-290, a condensed catalog of its full line of air conditioning, heating, ventilating and heat transfer equipment, supplementing some 40 specialized bulletins on various product lines, has been issued by The Trane Co., La Crosse, Wis. It presents terse descriptions of each line, supplemented with cutaway drawings, products and parts photographs, construction features, and condensed tables summarizing the range of capacities, sizes and dimensions. .....**Item 33**

OIL MIST PRECIPITATOR

A 4-page catalog No. E50 on its oil mist precipitator has been issued by Trion, Inc., McKees Rocks, Pa. These precipitators are specifically designed to eliminate coolant oil mist and smoke from high speed metal cutting operations. Folder explains purpose, principle of operation, and features and applications of the precipitators, which are made in four models. .....**Item 34**

CLOTH TYPE DUST COLLECTORS

A 36-page catalog, Dust and Fume Control, Catalog 72-B, which describes the various sizes and models of Dustube collectors (cloth-tube type) and the advantages to be gained from cloth filtration, is issued by American Wheelabrator & Equipment Corp., Mishawaka, Ind. The description of each type of collector is accompanied by complete specifications, construction drawings, cutaway views, and illustrations of typical installations. .....**Item 35**

GLASS DUCT INSULATION

A new bulletin has been issued by Gustin-Bacon Mfg. Co., Kansas City, Mo., 16 pages, entitled Ultralite Dust Insulations, and describing that product, which is a glass fiber blanket for the insulation of heating, ventilating or air conditioning ducts. It can be used either on the outside of the duct or as a liner for sound control. Bulletin is particularly comprehensive and well prepared in giving complete information on all of the properties and characteristics of the material as well as methods of application and finishing. .....**Item 36**

COMPREHENSIVE PUMP CATALOG

A 64-page catalog covering its entire line has been issued by Lancaster Pump and Mfg. Co., Inc., Lancaster, Pa. It includes complete data on the company's new Sub-Aqua submersible pumps. The catalog, which is durably bound, tab-indexed and illustrated, includes all necessary data on the company's shallow well pumps, jet pumps, packaged systems and pumps, turbo packaged systems, turbine pumps, hand pumps, centrifugal unit pumps, reciprocating pumps, pumps for emptying laundry trays, and sump pumps. .....**Item 37**

TANK CAPACITY CHART

A handy chart for quickly figuring the number of gallons of a liquid in any horizontal tank without the use of tables, formulas or computations is available from Armstrong Machine Works, Three Rivers, Mich. The chart and explanation is printed on an 8½ x 11 inch card suitable for hanging on the wall for quick reference. .....**Item 38**

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

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BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

HEATING AND VENTILATING
148 LAFAYETTE STREET
NEW YORK 13, N. Y.

READERS' SERVICE DEPT.

AUTOMATIC REGULATING VALVES

Bulletin 700, issued by Spence Engineering Co., Inc., Walden, N. Y., features a large cutaway illustration of its pilot-operated regulating valve with detailed explanations of five design features. In addition, a panel is devoted to showing how the control function of a regulator can be changed by using a different sensitive pilot. .....Item 39

OIL, GAS, COAL HEATING EQUIPMENT

Form 2129, a standard size, 16-page catalog in color has been issued by Iron Fireman Mfg. Co., Cleveland, Ohio, and devoted to its complete line of industrial, commercial and domestic automatic firing equipment for burning oil, gas and coal. The bulletin is in reality a condensed catalog giving terse but informative descriptions of the company's comprehensive line. .....Item 40

CO_2 RECORDER FOR POWER PLANTS

A 12-page bulletin, No. 51-1008, entitled Hays Condu-Therm CO_2 Recorder, has been issued by The Hays Corp., Michigan City, Ind., and describing this recorder which brings together in one instrument a design based on (1) use of CO_2 measurement as a guide to combustion efficiency, (2) the thermal conductivity principle of gas analysis, and (3) electronic type operation. The instrument is for power plant use. ..Item 41

CATALOG AND ESTIMATING GUIDE

A 24-page catalog covering the major part of its line of fans, pumps, motors, condensers, and accessories, has been issued by M. Blazer & Son, Passaic, N. J. The catalog was designed primarily to be a handy estimating guide for refrigeration, ventilation, heating, and air conditioning contractors. .....Item 42

RELIEF VALVE CATALOG

A 4-page folder illustrating and describing its line of air, gas, steam and liquid relief valves for original equipment application has been published by Kunkle Valve Co., Fort Wayne, Ind. Valves formerly made by Star Brass Mfg. Co., Boston, but now manufactured by Kunkle are also shown. .....Item 43

FILM TYPE ELECTRIC HEAT ELEMENT

Film type heating elements are the subject of a brochure published by Electrofilm Corp., North Hollywood, Calif. Booklet covers the uses, methods of application, mechanical, thermal and electrical characteristics of the element. Material is an electrically conductive plastic that provides highly uniform heat distribution and maximum heat transfer. A wide range of successful applications is covered. .....Item 44

INDUCED DRAFT COOLING TOWERS

Publication of Bulletin S-101 describing its 1952 line of the standard series induced draft cooling towers is announced by Cooling Tower Div., Havens Structural Steel Co., Kansas City, Mo. The bulletin contains selection, dimensional, and other engineering data for use in applying these cooling towers to refrigeration and air conditioning jobs of 2 tons capacity and up. Several major improvements have been made in the design to give longer life with less maintenance. The towers are now offered with all steel parts either hot dipped galvanized after fabrication or coated and painted with special finishes. ..Item 45

ELECTRIC UNIT HEATERS

An industrial unit heater catalog, EC-62R, has been issued by Electromode Corp., Rochester, N. Y. It gives complete descriptions, specifications and illustrations of the company's suspension-type, combination portable and suspension, and explosion-proof electric heaters. Includes data on control equipment, mounting and wiring diagrams, and illustrations of typical installations. .....Item 46

EXPANSION JOINT DESIGN GUIDE

An illustrated catalog, No. CMH-127, describing all types of corrugated expansion joints has been published by Flexonics Corp., formerly Chicago Metal Hose Corp., Maywood, Ill. It gives complete specification and installation data for free-flexing joints for low pressure applications; controlled-flexing joints for greater traverse, and joints for high pressure applications. Also covered in the catalog are dual, hinged, balanced, and bulkhead units. .....Item 47

HEATING COILS

A complete line of steam and hot water coils for a wide range of applications, in both standard and non-freeze types, is described in a new edition of Bulletin DS-385, published by The Trane Co., La Crosse, Wis. It gives capacities, selection, performance, installation and dimension data on all the company's heating coils. .....Item 48

ELECTRIC AIR HEATERS

Portable and built-in electric air heaters are described in a folder F-1530 available from Edwin L. Wiegand Co., Pittsburgh, Pa. Convection, blower, duct and radiant types available for immediate shipment are shown along with suitable automatic controls. Application photographs illustrate factory and office uses. .....Item 49

Product Information Service

Use the postage-free postcards below for requesting further information on products mentioned in the following sections of this magazine:

News of Equipment and Materials • New Catalogs

Simply circle the numbers of the items in which you are interested. Please print your name and address.

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BUSINESS REPLY CARD

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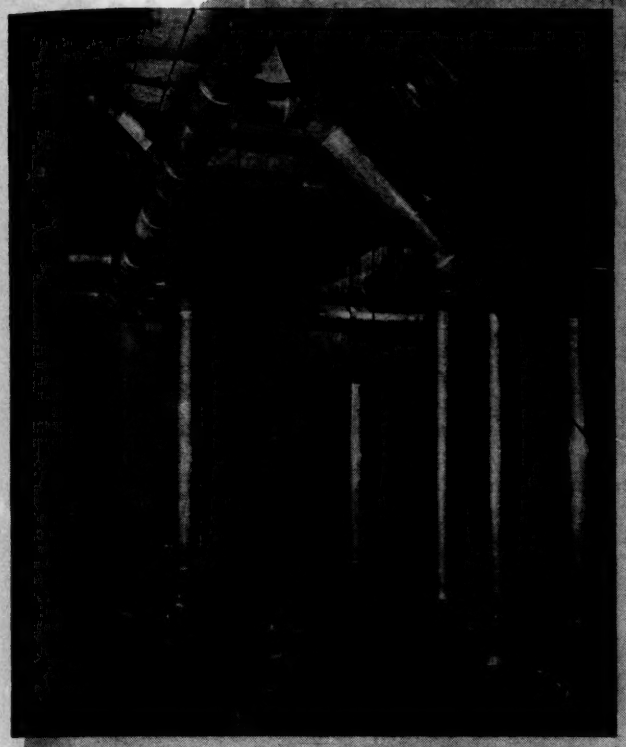
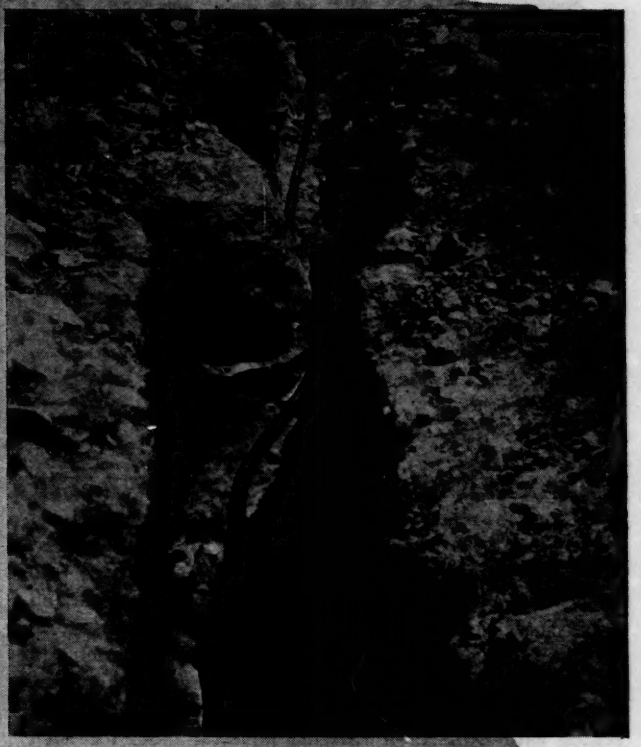
Now, it makes more sense than ever to use...



ONE VITAL SPOT where Revere Copper Tube can be used is in the conveying of liquids in industrial processing. Here is just the place for Revere Copper Tube to show its true worth. For it is non-rusting and will resist the corrosive action encountered in many of the process applications.



UNDERGROUND Revere Copper Water Tube resists the corrosive action of water inside and that of the soil on the outside. It can be bent around obstructions; made to follow the contours of the ground. Its long sections, which may be had in coils, are easier to handle, require fewer fittings.

COPPER WHERE IT COUNTS!

USING Revere Copper in the vital spots has always made common sense. Now, with copper restricted for some uses and limited for others, it becomes even more important to use "Copper Where It Counts!"

Three of these places are: industrial process lines, underground service lines and for domestic hot and cold water lines. Revere Copper Water Tube can be used for these purposes. So, whether you are a contractor, engineer or builder it will pay you to specify and use what copper you *can* get where it will do you and your customers the most good. That means in the spots where rustable materials can't stand the gaff.

Revere Copper Tube is non-rusting, has high corrosion resistance, is easily worked, installation costs are no more than for short-lived materials. It is joined with solder or compression fittings. Revere Copper Tube is ideal for replacement as it is readily bent, requires fewer fittings. It is available in hard and soft tempers, in straight lengths; also in 60′ coils in soft temper. Each length is marked with the name Revere. Look for this mark. It assures uniform quality.

To maintain your reputation for top-quality jobs, while metals remain short, use Revere Copper Water Tube wherever you can. The Revere Technical Advisory Service will be glad to help you in every way possible. Avail yourself of this service through your Revere Distributor. Call him today.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

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Abstracts AND Reviews

Publications abstracted in this department should be ordered direct from publisher.

FLUID FLOW IN PIPES

For engineers or students, Fluid Flow in Pipes, by Clifford H. McClain is an ideal introduction or refresher covering the mechanics and dimensions of gas and liquid flow in pipes and ducts. The fundamental physical processes involved are explained in simple language, and the dimensions used in various systems of calculation are clarified.

The properties of fluids affecting flow are discussed with illustrations of the over-all influence of each. Theory, measurement and dimensions of viscosity, with particular attention to relationships between various methods of measurement, are carefully explained for the beginner, while derivation calculations are included for those who wish to explore the subject more deeply. Friction and energy balance problems involving turbulence and streamline flow are solved with emphasis upon consistency in the evaluation of such factors as the Reynolds number. Emperical formulas used in flow calculations are presented with a discussion of the physical basis for such formulas.

Applications of the principles in the book to problems in piping and duct work are presented with calculations. Engineers and others who encounter only an occasional problem having to do with fluid flow, and whose knowledge of the subject may have become a little hazy, will find particular value in the straight-forward tracing of consistent dimensional units through the calculations involved. The book fills a need for a treatment of the theory and practice of fluid flow in pipes from a dimensional viewpoint. It will not only enable the reader to gain a thorough understanding of basic principles but it will also help him to determine for himself whether he has expressed the terms of his calculations consistently.

Fluid Flow in Pipes, by Clifford H. McClain, 128 pages, 18 illustrations, 9 tables, bound in maroon fabrikoid, The Industrial Press, 1952. Price, $3.00.

ALCOA—AN AMERICAN ENTERPRISE

In 1886, Charles Martin Hall, then a young man of 22 years, who carried on his research in a woodshed, discovered a cheap process for making aluminum. The electrolytic fissure of aluminum oxide started the Aluminum Company of America, popularly called Alcoa. When the company was formed in 1888, it bore the name Pittsburgh Aluminum Co. This was changed to The Pittsburgh Reduction Co. shortly after its organization and in 1907 it was again changed, this time to its present name.

As can be expected, a company which has grown so rapidly in its 64 years has an interesting historical story to tell. Charles C. Carr, director of public relations for 15 of the most exciting years of Alcoa, and now retired, is the author of this account of an industry and an industrial company, one of the largest in this country. He tells the story of the company's early struggles for patent rights, for financial backing, and for consumer markets in a very readable manner.

Alco—an American Enterprise, by C. C. Carr. Cloth bound, 5¾ x 9¼ inches, 292 pages. Published by Rinehart & Co., Inc., 232 Madison Ave., New York 16, N. Y. Price, $3.50.

BOILER FEED WATER TREATMENT

Efficient generation of steam is dependent to a large extent upon the quality of the water used. Since water as generally delivered to the plant has not all the requisites for good steam production, it must be treated in order to avoid operating troubles, scale formation, priming and corrosion.

Boiler Feed Water Treatment has been prepared by F. J. Matthews as a technical guide for the operator of the small plant. This British book has been completely revised for its third edition, and parts rewritten to cover the more recent technical developments. New material has been included on silicate scale, hydrogen and demineralizing zeolites, colloidal conditioning, electrical scale prevention and avoidance of turbine deposits.

The text has been divided into five parts such as natural water supplies, scale formation, corrosion, foaming and priming, and analysis and routine testing.

Boiler Feed Water Treatment, by F. J. Matthews. Cloth bound, 5½ x 8½ inches, 207 pages. Published by Chemical Publishing Co., 26 Court St., Brooklyn, N. Y. Price, $4.50.

• • •

ENVIRONMENT AND HEALTH—The U. S. Public Health Service has issued a comprehensive paper-bound book of 152 pages dealing with environmental health. Prepared under direction of Mark D. Hollis, Assistant Surgeon General and Chief Engineer of the Public Health Service, it gives an inside into such phases as water pollution, air pollution, pest control, industrial health, school and rural environments, protection for the traveller, etc. Superintendent of Documents, Government Printing Office, Washington 25, D. C. Price, 75 cents.

PIPE FLANGES AND FITTINGS—Three standards in the field of pipe flanges and fittings have been approved by the American Standards Association. They are: American Standard Nonmetallic Gaskets for Pipe Flanges, B16.21-1951 (price, 60 cents); American Standard Wrought Copper and Bronze Solder-Joint Fittings, B16.22-1951 (75 cents); and the American Standard Malleable-Iron Screwed Fittings, 150 lb., B16.3-1951 (price, $1). These standards were developed by a committee organized under ASA procedure and jointly sponsored by the ASME, the Manufacturers Standardization Society of the Valve and Fittings Industry, and the Heating, Piping, and Air Conditioning Contractors National Association. American Standards Association, 70 E. 45th St., New York 17, N. Y.

MULTI-VENT

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low velocity air diffusion ceiling panels

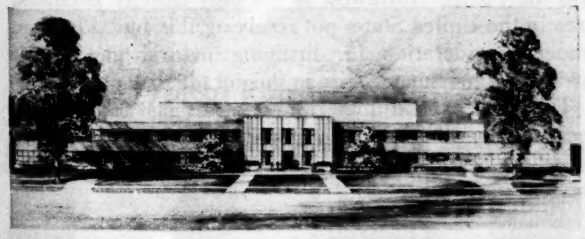
a *premium* air distribution system

Specified for dollar wise Insurance Companies

by Childs & Smith, Chicago
Architect-engineers for the four new buildings illustrated below

Shelby Mutual Casualty Co., Shelby, Ohio

Farmers Mutual Automobile Insurance Co., Madison, Wisc.



Utica Mutual Insurance Co., Utica, N. Y.

Lumbermans Mutual Insurance Co., Mansfield, Ohio

Comfortable, complaint-free air conditioned office spaces are an important factor in the productivity and employee relations of any company where office work plays an important role. That is why these insurance firms were readily convinced that their dollars were spent *wisely* on Multi-Vent panels for air distribution . . . a premium product which guarantees a superior, faultless performance worthy of their investment in the over all air conditioning system. For with Multi-Vent panels installed throughout, completely concealed in standard acoustical ceilings, a widespread, uniform air distribution is enjoyed free from all the hazards of drafts, noise and dirt. In addition the unique radiant panel heating or cooling effect of the Multi-Vent panel adds to the comfort factor.

Only Multi-Vent distributes air entirely by displacement rather than by high velocity injection. That means there are no strong air streams to aim and no change in air flow pattern when air supply is varied. Even with movable partitions and low ceilings, all problems of outlet location and direction adjustments for throw and drop to avoid drafts are eliminated . . . there simply are no drafts!

The use of Multi-Vent makes possible many sound economies in the basic heating, cooling, and air conditioning equipment in addition to substantial reductions in installation, maintenance, and redecorating costs. It pays to specify the finest in air diffusion systems . . . Multi-Vent. Write now for detailed literature and the name of the Multi-Vent sales engineer in your vicinity.

MULTI-VENT DIVISION

THE PYLE-NATIONAL COMPANY
1374 North Kostner Avenue — Chicago 51, Illinois

NEWS OF THE MONTH

GAS INDUSTRY

records gains in all departments except manufactured gas which is losing out to natural.

The tremendous demand for gas services that has existed since the close of World War II still continues and has lifted the gas utility to new high levels. Revenues from sales of utility gas in 1951 for the first time passed the two billion dollar mark, according to a year end review by George F. Mitchell, AGA president. A record number of customers was added to gas utility lines and these customers were served an all-time record volume of utility gas. Nearly $1.5 billion was allocated by gas utilities for new plant and equipment in 1951.

The natural gas industry continued its spectacular growth, bringing natural gas to new territories and augmenting deliveries made to areas formerly served. Conservative estimates indicate that of the $1.5 billion total, nearly $1 billion was spent in 1951 for construction of new natural gas transmission systems and expansion of the present pipeline network. Even this huge expansion program fell short of keeping pace with consumer demand for gas. AGA estimates that in the five years from 1951 through 1955, nearly $4.6 billion would be spent by the gas industry for expansion.

• **STATISTICS.**—The gas utilities were serving approximately 25,392,000 customers at the end of 1951, including about 322,000 LP-Gas customers served directly by gas utility companies. This marks the first time gas utility customers have numbered more than 25 million. The 1951 figure represents an increase of 3.7% over the previous record figure of 24,478,000 customers on gas utility lines at the end of 1950.

Of this record number of customers served, approximately 17,167,000 were receiving natural gas, a gain of 14.2% over the 15,030,000 natural gas customers a year earlier. Manufactured and mixed gas customers totaled 7,902,000 at the year-end, a decline of 13.4%. This decrease reflects the effects of change-overs by several large utility companies to the distribution of natural gas.

Residential gas customers numbered 23,412,000 at the end of the year, an increase of about 3.7% over a year earlier. In addition to these customers of the gas utility companies, it is estimated that nearly 6,500,000 customers are served with LP-Gas in areas not served by gas utilities. This means that more than 30,000,000 homes are served with utility gas or bottled gas.

Total sales of gas amounted to 47,869,000,000 therms, an increase of 13.7% over 42,090,100,000 therms sold in 1950. Natural gas sales totaled 44,421,000,000 therms, up 15.4% from a year previous. Manufactured and mixed gas sales were down 4.0% to total 3,359,000,000 therms.

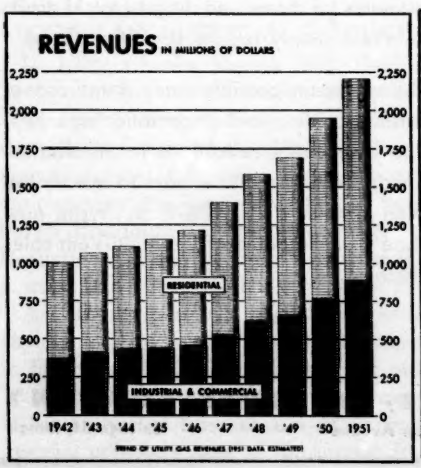
Revenues from the sale of gas reached a new record level of $2.20 billion, a gain of 13.2% over the previous high established in 1950. Natural gas revenues continued their spectacular gains, rising to a total of $1.65 billion, an increase of 21.2% over the previous year. Again reflecting the impact of change-overs, manufactured and mixed gas revenues were down 5.4% to aggregate $535,210,000 in 1951. The balance of gas industry total revenues resulted from sales of LP-Gas.

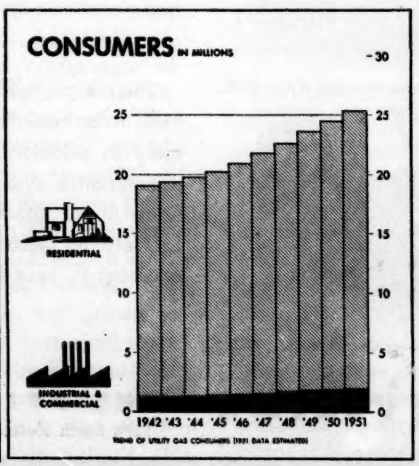
• **NATURAL GAS GROWTH.**—Natural gas facilities continue to show almost miraculous growth. The Federal Power Commission authorized construction of more than 12,000 miles of pipeline in 1951, and applications for almost that amount are pending before the Commission at the year-end.

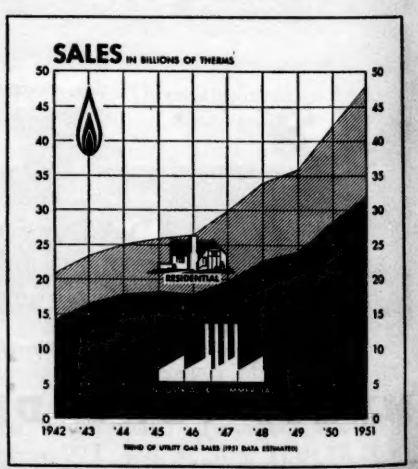
The rapid extension of natural gas lines and the consequent expansion of natural gas service in both new and old areas continues unabated. During 1951 natural gas reached New England and the first cities were converted to this fuel, nearly two thousand miles from the wells. Extension of the pipeline systems through the area is under way.

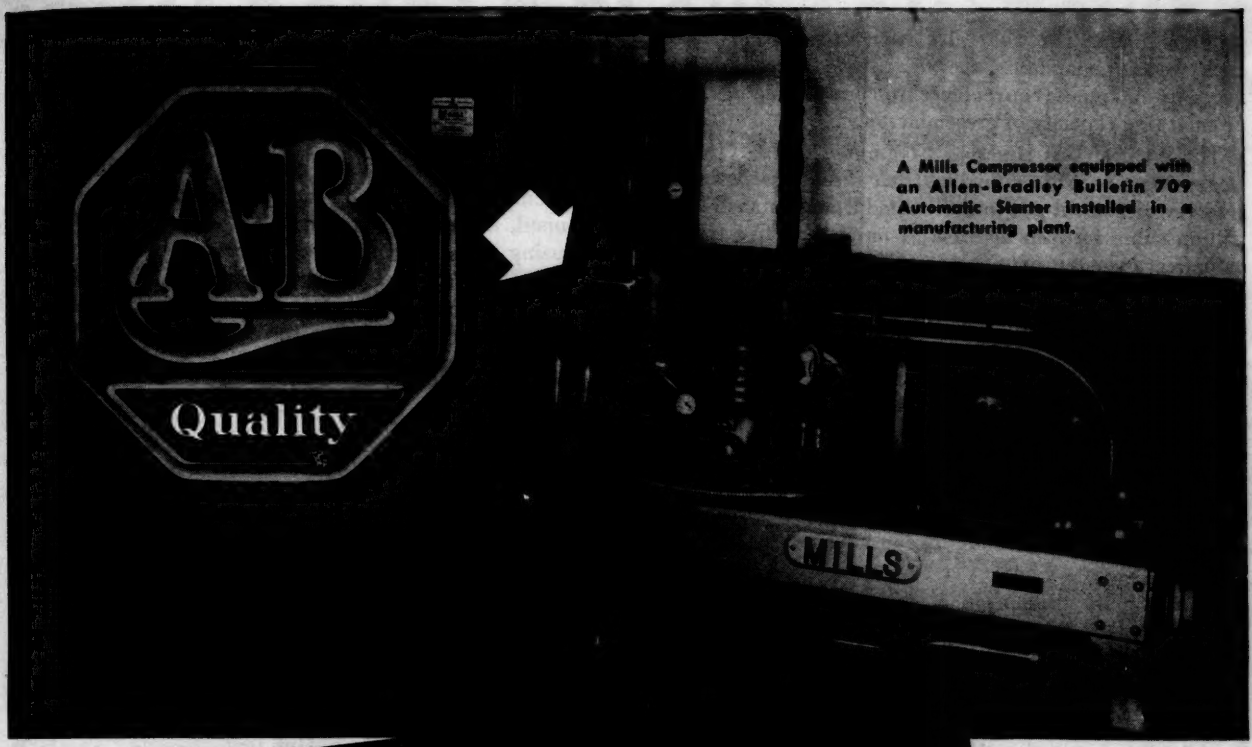
With natural gas in New England as an accomplished fact, there are now 39 states receiving this premium fuel, and the Pacific Northwest is the only heavily populated area in the United States not receiving this fuel. Plans are under consideration for bringing natural gas to this region that may materialize in the not too distant future.

The vast expenditures for natural gas transmission facilities must be based on ample reserves of natural gas









A Mills Compressor equipped with an Allen-Bradley Bulletin 709 Automatic Starter installed in a manufacturing plant.

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A-B Bulletin 836 pressure control and A-B Bulletin 837 temperature control. Accurate, rugged, compact units.

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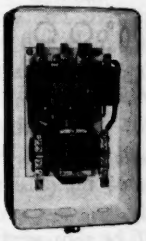
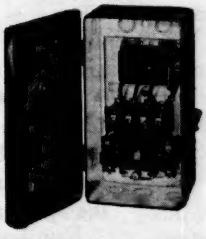


A-B Bulletin 709 solenoid starter. Note white interior for ease of wiring.

COMBINATION STARTER



A-B Bulletin 712 disconnect switch type combination starter. Saves installation time.

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ALLEN-BRADLEY SOLENOID MOTOR CONTROLS

to draw upon. The Federal Power Commission makes such reserves mandatory before issuing a certificate of necessity and public convenience for constructing new lines or enlarging capacity of present systems.

The Natural Gas Reserves Committee of AGA at the beginning of 1951 estimated that proved recoverable reserves of natural gas in the United States totaled 185.6 trillion cubic feet, an increase of more than five trillion cubic feet over the previous year, despite record production of 6.9 trillion cubic feet during 1950. Over a long period of years, the proved reserves of natural gas have continued to gain each year.

• **STORAGE.**— An important step was taken by the Natural Gas Department during the year in the organization of a committee to study the engineering and economic factors affecting underground storage of gas. The growing importance of storage in maintaing service in winter months, and in the economic operation of the system, requires that the best talent available undertake industry-wide studies of the subject.

More than 350 billion cu. ft. of natural gas are stored underground at the close of the off-peak gas industry season. It is estimated that the industry will spend more than 100 million dollars in the next three years on underground storage facilities.

• **RESEARCH.**— The research work on natural gas production and distribution has developed a humidity recording device rugged enough for pipeline application and sensitive enough to control dehydrator operation. Nineteen of these devices, entirely the result of a research project, are now in service or on order. Results of the first series of tests on orifice meter installation requirements have been published in bulletin form.

The industry is finding increased application of the Hall high Btu. oil gas sets for the production of oil gas where high Btu. gas is distributed, or for supplementing natural gas supplies. Some 22 sets are now in operation or on order. This process was developed under the AGA gas production research program.

The first step in the production of a substitute natural gas is well along under a coal gasification project being carried on at the Institute of Gas Technology. A pilot plant has been finished and undergone shakedown tests. Trial runs have produced encouraging results.

• Underground storage for defense production machines will be provided by Army Ordnance Corps, with renting of a 14 acre cave near Atchison, Kansas. Because the cave offers a constant temperature of 63 to 65 F, and relative humidity of 75%, no heating or dehumidifying is necessary. Based on gross storage space of 650,000 sq ft, annual rental and maintenance costs 7½ cents per foot, as compared to approximately 50 cents per foot for commercial warehouse space.

• W. H. Wise has been appointed to the post of director of sales for Bryant Heater Division of Affiliated Gas Equipment, Inc., Cleveland, Ohio. Mr. Wise has held the post of assistant director of sales for the past year and was midwestern sales manager before joining Bryant's headquarters sales staff. He succeeds J. N. Crawford, who was appointed to the position of assistant to the president of Affiliated Gas Equipment, Inc.

UNUSUAL HOUSE

built for tests will have movable walls and flexible plumbing connections.

The most unusual house of the year has been built on the University of Illinois campus by the Small Homes Council, as part of a research project sponsored by the Housing and Home Finance Agency.

• **FLEXIBLE.**—The house is so flexible in its use of interior space that even the bathroom and kitchen can be moved to different locations inside the structure. Use of flexible connections instead of regular pipe and fittings makes this possible. The entire house can be made larger or smaller in a few hours by two men with the simplest tools.

• **OBJECTIVE.**—The experimental house, or space use laboratory as the technicians call it, will be used to test the way families live in different arrangements and sizes of rooms. The research project as a whole is aimed at developing space requirements, or standards, for modern family living. Results are expected to help the housing industry build the greatest amount of needed space into homes with minimum waste.

Research experts conducting the study emphasize that the unique house is no mere stage prop. It will be lived in by two representative families, one after the other, to test different space situations. Different sizes and shapes as well as different arrangements of rooms and fixtures will be tested by each family.

• **STRUCTURE.**—On the outside, the test structure looks like almost any small one-story house of contemporary design—but probably no other house is as "changeable." It is constructed so that the interior partitions and outside walls are free of the roof-weight, and therefore are readily movable. This permits size, shape, and location of all rooms to be changed at will.

The bathtub is on wheels, while the other bathroom fixtures are on wall panels which can be moved. It will be possible to split the bathroom, thus providing the popular, divided bath if space studies require it. All the kitchen equipment likewise is readily movable.

The house is built on a 32- by 48-ft floor area. Now a 24- by 36-ft structure, it can be made larger or smaller by merely changing the positions of the outside walls and adding floor panels. Shifting the walls about is easy to do because the entire weight of the roof is supported by columns placed at the edges of the structure.

There is no roof, or ceiling over that part of the laboratory not enclosed by the house. This will be added later when it is required. The wall panels themselves are variable. Different panels will offer a variety of window sizes and door sizes as the tests require.

• **OCCUPANTS.**—Two families will occupy the house, each for a period of six months, according to plans outlined by Prof. Rudard A. Jones, Small Homes Council architect and chairman of the University committee working on the space study.

Families will be representative of those occupying small houses today. According to specifications, each family will consist of a couple, approximately 30 years old, having two children—a girl and a boy, one of whom is to be of school age and the other of pre-school age.

Each family living in the house is to be subjected to various changes in room arrangement. A new room arrangement will be tried each month. Both the size and

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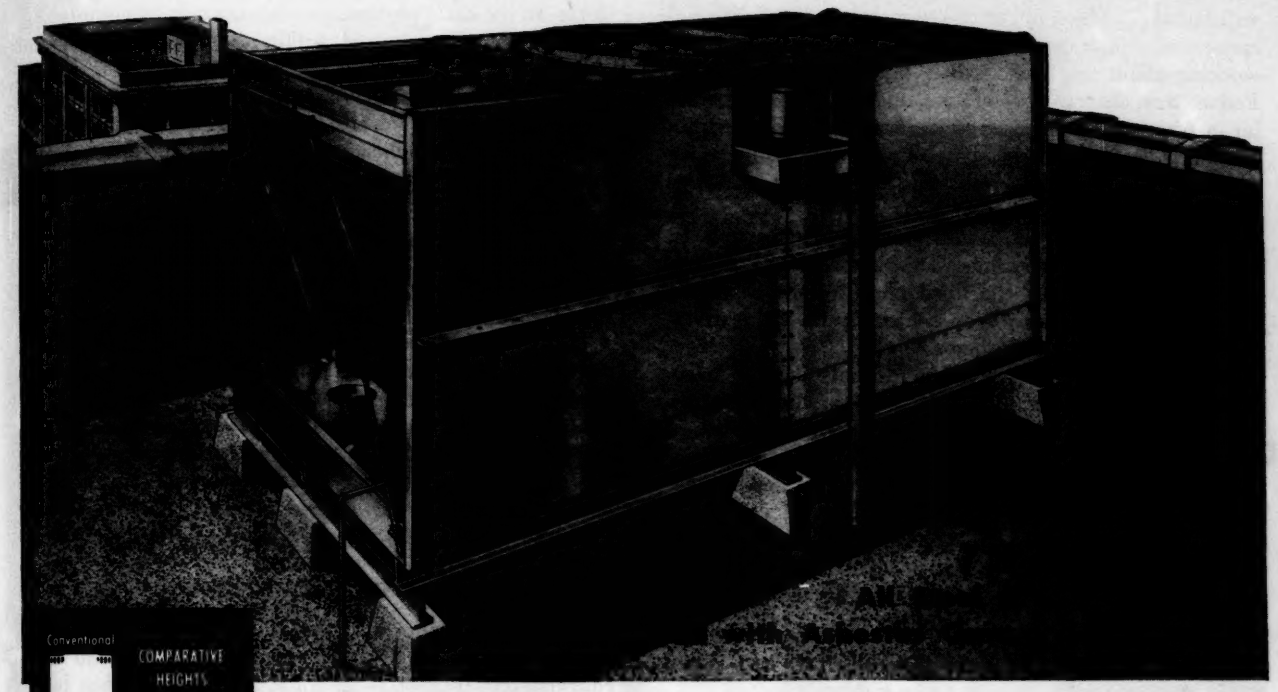

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location of rooms will be varied. Some space arrangements that differ radically from those used in the majority of homes today will be included.

At the end of each month, the members of the family will be questioned concerning their reactions to the particular arrangement tried that month. Both the efficiency of the arrangement and the psychological effect will be charted. Wherever possible, quantitative measurements will be taken. The number of steps required in the use of household equipment and the pattern of movements in working about the house will be recorded mechanically. Pedometers, electric-eye counters, door counters, and similar instruments will be used to trace traffic patterns within the house. As a final test, the occupants will be given an opportunity to suggest some arrangement plan which they would like to try.

By these methods, the researchers hope to be able to compare room arrangements. This laboratory approach to the study of space—the third phase of the Council's study—has been impossible to achieve in the field-survey types of study previously made.

• **PARTICIPATING.**—University of Illinois faculty members participating in the study include architects, home economists and sociologists. Others besides Professor Jones are Byron E. Munson, research associate, and Richard Dewey, assistant professor, both in the department of sociology and anthropology; Miss Helen McCullough, assistant professor in the department of home economics; and William H. Kapple, research assistant professor of architecture in the Small Homes Council. George Speer, Chief of Technology for the HHFA Division of Housing Research, is the Agency's project engineer.

5-YEAR COMPRESSOR WARRANTY

on open type refrigeration offered by Brunner as service protection on 23 models.

Effective February 1 all Brunner open type commercial refrigeration compressors from ¼ hp to and including 10 hp models will be offered with a 5-year protection plan as option in addition to the Brunner standard one-year warranty. Some 23 air and water cooled models will come under this service protection. The open type compressors in Brunner's 3, 5, 7½ and 10 hp self-contained floor type BAC air conditioners will also be offered with this new 5-year protection policy.

In commenting on the announcing of this plan, unique to the open type unit division of the refrigeration industry, Frank C. Hawk, Brunner director of sales, stated dealers in making the 5-year protection policy available to their customers are really saying in effect, "we have such great confidence in the operating satisfaction of our product we unhesitatingly express that confidence in the form of insurance protection to your investment for a full 5 year period."

Users of commercial refrigeration in these capacities can now enjoy the many application advantages of open type refrigeration and know that the compressor—the body casting and/or any of its parts—will be repaired, replaced, or exchanged without charge by Brunner in the event of mechanical failure within the 5 year period where covered by the plan.

• **OPERATION.**—In operation, this 5-year protection policy is simple. Each Brunner compressor when leaving the factory will have an application form attached. If the dealer wishes to avail himself and his customer of the protection plan he will fill out this form and mail it to the factory. The factory will issue the 5-year protection policy in the name of the customer and mail it to the customer. Attached to the warranty will be a service application form. In the event replacement or exchange of compressor parts should be required within the 5-year period, the dealer will use this application form as a request for needed replacement parts without charge. He will, of course, make his usual charges to the customer for labor and transportation. The service application form is again returned to the customer for further use should it become necessary.

Where the dealer may use the service application form to pick up compressor parts from the distributor's stock, the replacement parts will be shipped direct to the distributor. All 5-year protection policy record keeping or paper work is taken care of at the Brunner factory.

• **WELL RECEIVED.**—As expected, enthusiasm for the 5-year protection plan ran high among Brunner's distributors and dealers. Many phone calls, telegrams and letters were received at the factory congratulating Brunner's management on their action as the first manufacturer of open type refrigeration units to offer such a comprehensive protection on compressor bodies . . . this in addition to their one year warranty covering the complete unit.

• Otto J. Nussbaum has been appointed chief engineer of the Kramer Trenton Co. Mr. Nussbaum, who was educated and trained as an engineer in Europe, has been with Kramer since 1939. He succeeds S. Charles Segal, who was recently elevated to the position of general sales manager.

OIL SITUATION

fairly well set for all-out war, researcher tells engineers.

The United States' growing demand for petroleum products would be a blessing in disguise in the event of an all-out war, a member of General Motors Business Research Staff told the American Society of Mechanical Engineers in Atlantic City, November 27.

Reporting on the impact of defense activities on petroleum fuel supplies, Adam K. Stricker, Jr., declared the "expansion of our civilian uses (of petroleum and petroleum products) actually provides a more substantial cushion to meet military needs."

• **SURVEY.**—In his survey of oil refining and reserve capacities of the United States and other petroleum producing nations, Mr. Stricker pointed out that during the first six months of 1951, motor vehicle gasoline output reached an annual rate of approximately one billion barrels.

This compares with 600 million barrels in 1939, an increase of about 73%. Motor vehicle registrations have also increased since 1939 by 59% and annual gasoline consumption per car is up about 10% since 1939, he said.

Civilian gasoline demands absorb the available supply,

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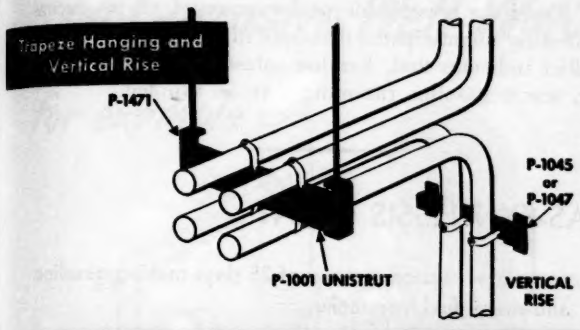

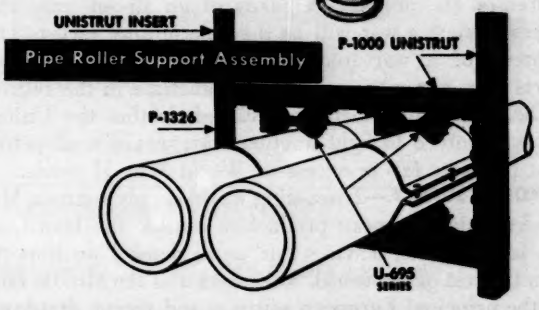

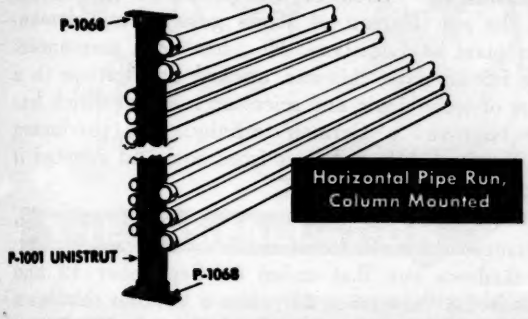

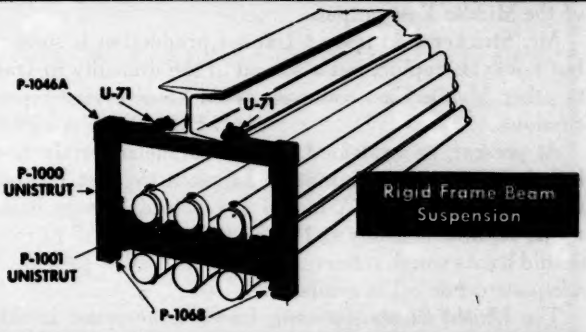

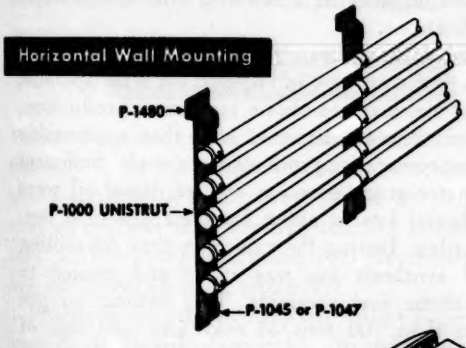

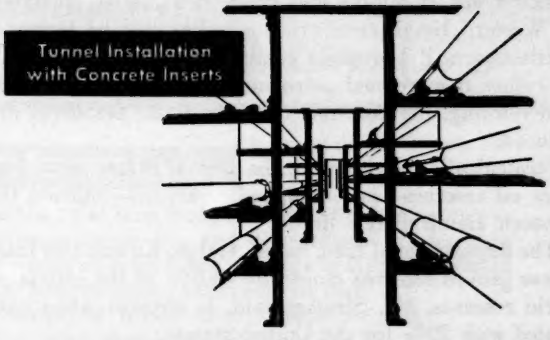

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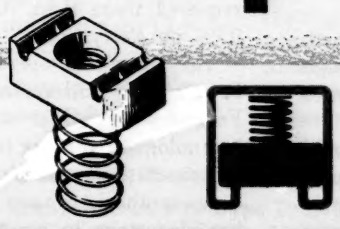

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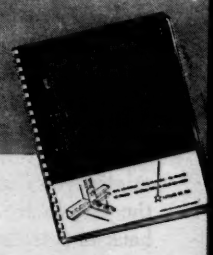

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and some may draw the conclusion that there is no greater margin today to meet increased requirements than there was in 1939. This is not the case, however, Mr. Stricker said, as it is far easier to meet military needs by diverting the necessary gasoline from a large daily output than it is from a much smaller one.

He explained that more than 6,000,000 barrels of refined petroleum products are delivered daily in the United States, and oil companies are expanding their production as fast as possible to meet not only the increasing civilian demand but also the eventuality of all-out war.

No crystal ball, Mr. Stricker said, can supply accurate figures on the military demands of an all-out war. The nature of such a war will be the determining factor. The outbreak of a war tomorrow would produce different effects than a similar occurrence sometime in the future.

The outstanding fact, he declared, is that the United States, if forced to fight another war, would need petroleum products far in excess of World War II needs.

• **WORLD SUPPLY.**—Discussing world supply sources, Mr. Stricker said European production outside the Iron Curtain is negligible, leaving Europe to depend on imports from the rest of the world. Venezuela and the Middle East are the principal European sources, and recent shutdown of Iran's Abadan refineries has curtailed about one-third of the Middle East output.

Mr. Stricker said loss of Iranian production is serious but not catastrophic, but a spread of the difficulty in Iran to other Middle East countries could have serious repercussions.

At present, he explained, some Venezuelan production is being diverted to Europe to supplant the lost Iranian supply. Meantime, ECA money has helped Europe build up its refining capacity so that by the end of 1952 Europe should have enough refineries to meet its needs—providing adequate crude oil is available.

The United States, he said, has a large stake in this European refining capacity. We have paid for much of it as taxpayers. If Middle East crude is available, demands on Western Hemisphere crude supplies will be lessened. Furthermore, if European countries can purchase crude oil rather than refined petroleum products and do their own refining, the demands on their dollar resources are reduced.

Strategically, he declared, the United States must consider oil reserves—i.e., untapped reservoirs—outside the Western Hemisphere's limits.

The importance of Iran, Saudi Arabia, Kuwait and Iraq, whose proved reserves constitute 46.6% of the estimated world reserves, Mr. Stricker said, is obvious when contrasted with 29% for the United States.

• **TRANSPORT.**—In event of all-out war, he explained, the major problem would be transportation, enough tankers, railway cars and pipelines to move petroleum to both military and civilian consumers.

Tankers would be diverted to supply Europe should the Suez Canal be closed, Mr. Stricker warned. Local shortages of petroleum products in the Northeast may occur should this diversion be necessary. The government might even find it necessary in an all-out war to reconvert the Big Inch and Little Big Inch lines from natural gas back to petroleum, although this is not likely.

Many users of heating oils and natural gas in the Northeast would be forced to use coal under such conditions. We are now sending coal to Europe so this, too, poses new problems. The coal docks at Norfolk have never coped with this dual demand.

Mr. Stricker said that fortunately the non-Iron Curtain nations have most of the world's tankers and we have at least more flexibility in meeting shifting petroleum supply situations than do our potential enemies.

The pipeline network in the United States transports tremendous quantities of crude and refined products, the speaker pointed out. Two dozen major oil and natural gas pipelines are now under construction. We will be in a much better position to meet increasing mobilization demands when they are completed.

He said the remarkable performance of oil producers in meeting unanticipated demands in the present Korean conflict indicates that, barring catastrophe or an all-out war, severe gasoline rationing may be avoided.

GAS-SYNTHESIS PLANT

completes second test run of 25 days making gasoline and diesel fuel from coke.

Successful completion of the second integrated test run of the new Bureau of Mines gas-synthesis demonstration plant at Louisiana, Mo., has been announced. Lasting for 25 days, this run marked a milestone in a program of technologic and scientific research which has greatly improved a German technique for producing gasoline and other liquid fuels from coal and adapted it to American conditions.

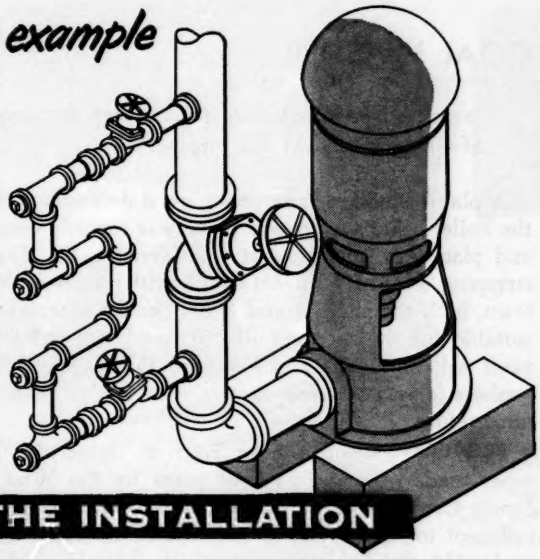
• **SHAKEDOWN.**—The plant was started on October 23, after changes shown to be desirable by the initial eight-day shakedown run that ended on September 12 had been made. By November 28, when a routine shutdown was made, enough raw gasoline and diesel fuel had been produced to permit later final refining of these products to meet specifications.

Although the primary purpose of the run was to show that all phases of the process and equipment were operable and no attempt was made to obtain maximum production, John J. Forbes, Bureau director, said that appreciable quantities of representative products were made. Sufficient amounts of motor-grade gasoline and of diesel oil were produced in barrel lots to allow for their practical testing and evaluation. During the run more than 52 million cubic feet of synthesis gas was made and treated to yield the synthetic fuel products. This amount of gas required more than 700 tons of coke and 450 tons of 95% pure oxygen.

The successful operation of the demonstration plant is a major achievement of coordinated research, Mr. Forbes stated. Over a period of several years Bureau technologists working in laboratories, pilot plants and the demonstration plant have cooperated effectively to bring a gas-synthesis process adapted to American coals from the idea stage to practical operation. It is unusual, he added, for a new plant to operate so smoothly for so long a time in an early run.

• **PROCESS.**—The gas-synthesis process, the director pointed out, is one of the three major methods for producing synthetic oil on which the Bureau is working intensively. The others are coal hydrogenation and the

How's This For Solving a Valve Problem ...on Corrosive Well Water, for example



THE INSTALLATION

On outlet of well water pump supplying plant of Barr Rubber Products Co., Sandusky, Ohio. Sulphur content of water extremely high.

VALVE SERVICE RATINGS

SUITABILITY:	Just what was needed
MAINTENANCE COST:	None to date
CORROSION-RESISTANCE:	No evidence of corrosion
SERVICE LIFE:	Outlasted any 2 other valves so far
OPERATING RESULTS:	Pump shutdowns for valve repairs stopped
PRICE:	Much less than alloy valves
AVAILABILITY:	Stock item in Crane line

THE HISTORY

Valves formerly used here lasted no more than 6 months. Under constant exposure to severe erosive and corrosive effects, they failed to provide the easy operation and positive seating needed in this service. They required excessively frequent re-packing and seating maintenance.

Problem solved by replacing with Crane Packless Iron Body Diaphragm valves in main line and by-pass. Installed more than a year, they show no corrosion, no effects of service. Operate smoothly, seat tightly, with no maintenance needed to date.

THE VALVE

Crane No. 1611 Iron Body Packless Diaphragm Valves featuring separate disc and diaphragm. No packing to maintain; no stem leaks. Neoprene diaphragm used to seal bonnet only. Independent disc with neoprene insert insures positive seating even should diaphragm fail. Also fully neoprene lined valves. Many common and corrosive services. See your Crane Catalog or Crane Representative.

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processing of oil shale. In the gas-synthesis process, the coal is first converted to synthesis gas, composed of carbon monoxide and hydrogen, and this, in turn, is converted into oil by passing it over an iron catalyst.

Synthesis gas accounts for about 60 to 70% of the cost of gasoline produced from coal by the gas-synthesis process. This fact points up the importance of reducing the cost of gas production.

During the recent run, from 75 to 85% of the synthesis gas was converted to oil during a single pass. If the conversion can be raised to 90%, Bureau technologists conclude, the process can be operated with a single conversion stage instead of the two stages formerly considered necessary.

• **COAL GAS.**—Although synthesis gas for the two trial runs of the new plant was made by treating coke with oxygen and steam, it is intended to make this gas directly from coal later. Both the additional cost of producing coke and the need for conserving reserves of coking coals to meet the needs of the steel industry make coke impracticable as a raw material for large-scale operations in this country, Bureau technologists explained.

The economical gasification of coal, Bureau technologists point out, is the greatest problem remaining to be solved in connection with developing the gas-synthesis process to the point where private industry might be interested in adopting it for converting coal to oil. The Bureau of Mines is working on this problem in its laboratories at Pittsburgh, Pa., Morgantown, W. Va., Grand Forks, N. Dak., and Denver, Colo., and results obtained thus far are encouraging. The Bureau also is conducting experiments on the underground gasification of unmined coal at Gorgas, Ala., in cooperation with the Alabama Power Company.

• **BACKGROUND.**—The gas-synthesis process, also known as the Fischer-Tropsch process, has been known in Germany since 1926, and the Bureau began studying it and other synthetic liquid fuels processes in a small way at the Central Experiment Station at Pittsburgh about 1928. The present intensive research on this and other methods of producing liquid fuels from coal and oil shale, however, did not begin until 1944, when the Congress passed the Synthetic Liquid Fuels Act and made funds for these studies available after a lapse of 12 years.

Since 1944, Dr. W. C. Schroeder, now an assistant director of the Bureau, has been in charge of the Bureau's synthetic liquid fuels research and investigations. These studies have brought the production of synthetic liquid fuels from oil shale, and from coal by direct hydrogenation, to the point where these processes are about ready for adoption by private industry, he added.

Although the Germans operated commercial gas-synthesis or Fischer-Tropsch plants, the reactors they used for converting the synthesis gas to liquid fuels were cumbersome affairs with numerous small tubes through which the gas was passed over the catalyst. This made them expensive and required large quantities of steel. Up to the outbreak of World War II, which undoubtedly slowed their research, they had been unable to build a reactor with a capacity of more than 20 barrels a day. This meant that a large plant would require many converters, with correspondingly high requirements not only for materials but for operating manpower.

• **PROBLEM.**—The principal problem in designing a reactor for the gas-synthesis process, Dr. Schroeder explained, is that of removing the large amount of heat evolved. If this is not done, the catalyst heats up and becomes useless. The solution used in the German wartime plants was to cool the small catalyst-containing tubes with water or steam. This method of cooling resulted in low throughput and was not practicable for large units, which accounts for the small capacity of the German reactors.

The type of reactor used by the Bureau of Mines at Louisiana requires less steel, is simple to construct, and has a capacity 6 to 8 times that of the German reactors per unit of volume. In addition, it can be built to produce 1,000 or more barrels of oil a day if desired.

COAL WASHER

recovers coke from power station ashes. Accumulation of 40 years to yield 200 tons per day.

A plant capable of recovering good domestic fuel from the boiler ashes of a power plant was recently completed and placed in operation at Connellsville, Pa. The coal stripping firm of Ford & Gaskill, with offices in Masontown, built the plant around a Pool coal washer of a type suitable for the recovery of unburned fuel from power plant ash and clinker. Unique in this application, the washers also are used in the recovery of coal from mine refuse.

• **PRODUCTION.**—The coke recovery from the boiler ashes made over the past 40 years by the West Penn Power Company at its Wheeler power station, a reserve sufficient to last several years, will be in domestic sizes ½ by 1¼ and 1¼ inch up to the larger pieces of about 6 inches. The quality is said to compare with the best coke made in the region in beehive-type ovens. Plans call for regular production of about 200 tons of coke per day.

At present, the raw material is transported by truck about 700 feet to the plant which is located on a 22-acre parcel of land. Trucks dump the ash-clinker mixture into a large steel hopper covered with a heavy grille with four inch apertures which separate oversize material in advance of the washer. The bin feeds a 45-foot feed conveyor serving a large vibrating screen where the undersized material less than ½-inch is removed. From the screen, the mixture enters the coal washer.

• **SEPARATION.**—In the washer a slurry of water mixed with suspended solids such as pulverized stone or garden soil is maintained at such specific gravity as to allow the heavy clinkers to sink while the combustible coke is carried through to a dewatering screen.

At the dewatering screen, the mesh of which is about 1/16 inch, clean water washes away residual solids carried from the washer and leaves the cleaned fuel in mixed sizes. The solids removed are returned to the washer while the saleable fuel passes on to a picking belt where off-grade material is removed by hand.

The fuel then passes to a sizing screen where the two merchantable sizes are separated.

The entire washing plant is housed under a building 25 feet wide by 50 feet long. Rejects from the plant, clinker and ash, will be used to make cinder block, driveway surfaces, and concrete aggregate.

Big scale heating here — and **MARSH** *throughout every building*

A number of the big, well-built structures of the New York Housing Authority are illustrated here. This is big-scale construction running into millions of dollars — the kind of project that asks for the most critical examination of all equipment entering into it.

In designing the heating for these buildings major emphasis was of course placed on end results: minimized operating and maintenance costs. So it is significant that Marsh Radiator Valves and Traps were used throughout all of these buildings.

The thousands of Marsh valves, traps, vents, and strainers that went into these buildings are performing in that trouble-free way that has won the confidence of the most exacting heating men.

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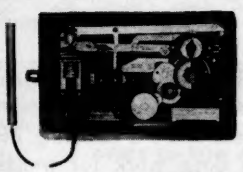

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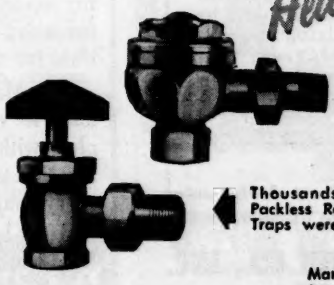
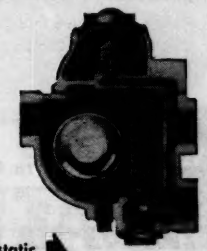


Thousands of these Marsh Packless Radiator Valves and Traps were used.



Marsh float and thermostatic traps were used throughout.

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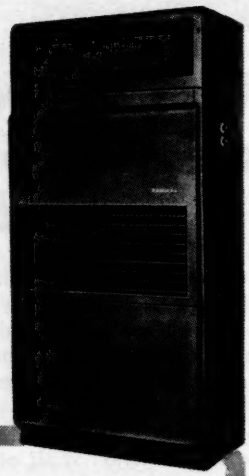

No wringing of hands or crying in their beer by Typhoon dealers. They make money on air conditioning—year in, year out. For Typhoon's policy is: "every dealer must prosper." And Typhoon makes good on this policy with a brass tacks program that brings in more dollars for dealers.

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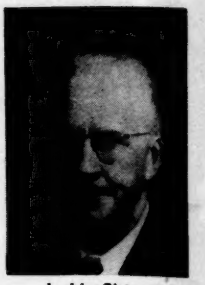
• Preliminary census reports indicate that use of gas for central heating in the United States in the past 10 years increased 433%, and in some sections, notably the Northeast, jumped by as much as 780%.

GETTING PERSONAL



J. H. Skipper

J. H. Skipper (*Air Conditioning Drug Stores*, page 93) at present district commercial sales manager, Charlotte, N. C. zone, York Corp., York, Pa., has had extensive experience in refrigeration and air conditioning.

A native of Arkansas, he was educated at Arkansas A & M. From 1926 to 1929 he served as sales supervisor for the W. P. Galloway Co., Frigidaire distributor in Little Rock, Ark. He was with Herbert Roberts, Frigidaire distributor in Fort Smith from 1932 to 1934 where he served as manager of the refrigeration and air conditioning department. From 1941 to 1945 he was with the U. S. Division Engineer Office at Columbus, Ohio.

Mr. Skipper affiliated with York Corp. in 1945. He was sales supervisor of the Charlotte, N. C. zone and about one year ago was promoted to district commercial sales manager, the position he now holds. His hobby is aviation and he owns his own airplane.

J. Marshall

James Marshall (*Calculations for Humidification Design*, page 75) is an M. E. graduate of the University of North Carolina. For 10 years he was with the Bahnson Co., Winston-Salem, N. C., one of the pioneers in the humidification business. While with this company he spent five years in their research and development departments, designing, testing and building new humidifiers. For the following five years (during World War II), he was in charge of the company's design and estimating department.

It was during this second five-year period that humidifier systems were designed for The Fairchild Plant in Burlington, N. C., Beech Aircraft in Wichita, Kans., and for some airplane subcontractors. This phase of design for wood working plants was an outgrowth of humidification for the textile industry.

Mr. Marshall has designed simple humidification systems as well as extensive air conditioning systems complete with refrigeration systems and air cleaning devices for the textile field. He has done work for practically every major textile company in this country.

After leaving Bahnson Co., he was affiliated with P. L. Davidson, consulting engineer. At present he has his own engineering office in Philadelphia, Pa., specializing in textile humidifying and air conditioning.

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The diagram shows a typical arrangement for a natural draft cooling tower as used in a small capacity refrigeration and air-conditioning system.

A Binks Type H tower offers exceptional *cooling performance* due to correct louver spacing and balanced spray system. Binks non-clogging ROTOJET spray nozzles produce maximum heat dissipation.

Such Type H features as external mounting flanges and simple corner post bolting mean *easy erection* (just 4 steps to assembly).

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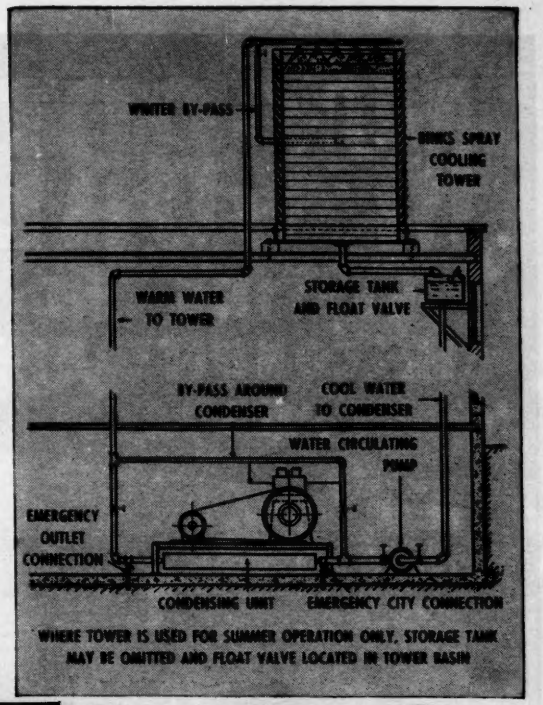
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Bulletin 31—Type S (150 to 600 GPM)
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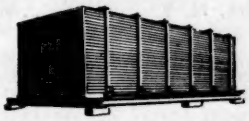

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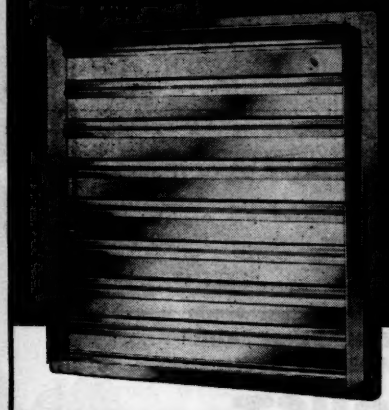

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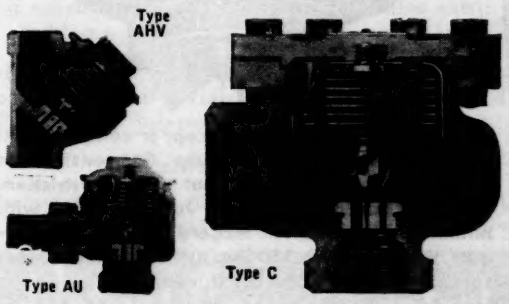

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COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

CORROSION ENGINEERS EXHIBIT—Annual conference and exhibition of the National Association of Corrosion Engineers, at Buccaneer Hotel, Galveston, Tex. Executive secretary of the Association, 905 Southern Standard Building, Houston 2, Tex. .....**MARCH 10-14, 1952.**

ASME MEETING—Spring meeting of the American Society of Mechanical Engineers, at the University of Washington, Seattle, Wash. C. E. Davies, secretary of the Society, 29 West 39th St., New York, N. Y. .....**MARCH 24-26, 1952.**

POWER CONFERENCE—First annual American Power Conference (formerly named Midwest Power Conference), sponsored by Illinois Institute of Technology, at Hotel Sherman, Chicago. Conference Director, Roland A. Budenholzer at Illinois Tech, Technology Center, Chicago 16, Ill. ....**MARCH 26-28, 1952.**

OIL HEAT EXPOSITION—National Oil Heat Exposition, at Commercial Museum, Philadelphia, Pa., in conjunction with the 29th annual convention of Oil-Heat Institute of America, at the Benjamin Franklin Hotel. R. H. L. Becker, secretary, 6 E. 39th St., New York 16, N. Y. .....**APRIL 14-18, 1952.**

GAS APPLIANCE MEETING—Annual meeting of the Gas Appliance Manufacturers Association at The Broadmoor, Colorado Springs, Colo. H. Leigh Whitelaw, managing director, 60 E. 42nd St., New York, N. Y. .....**MAY 21-23, 1952.**

NDHA MEETING—Annual meeting of the National District Heating Association at Skytop Lodge, Skytop, Pa. John F. Collins, secretary of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. ..... **JUNE 3-6, 1952.**

ASME MEETING — Semi-annual meeting of the American Society of Mechanical Engineers, at the Sheraton Gibson Hotel, Cincinnati, Ohio. C. E. Davies, secretary of the Society, 29 West 39th St., New York, N. Y. ..... **JUNE 15-19, 1952**

TESTING MATERIALS MEETING—Annual meeting of the American Society for Testing Materials at the Hotel Statler, New York, N. Y. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. .....**JUNE 23-27, 1952.**

ELECTRICAL ENGINEERS MEETING—Summer general meeting of the American Institute of Electrical Engineers, at the Nicollet Hotel, Minneapolis, Minn. Secretary of the Institute, 33 West 39th St., New York 18, N. Y. ..**JUNE 23-27, 1952.**

AGA CONVENTION—Annual convention of the American Gas Association, in the Auditorium, Atlantic City, New Jersey. Secretary of the Association, 420 Lexington Avenue, New York, N. Y. .....**WEEK OF OCTOBER 27, 1952.**

ASME MEETING—Fall meeting of the American Society of Mechanical Engineers, at the Sheraton Hotel, Chicago, Ill. C. E. Davies, secretary of the Society, 29 West 39th St., New York, N. Y. .....**SEPTEMBER 8-11, 1952.**

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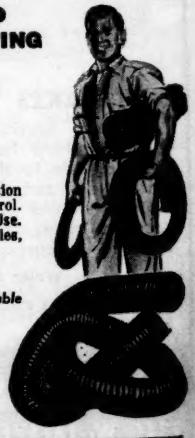

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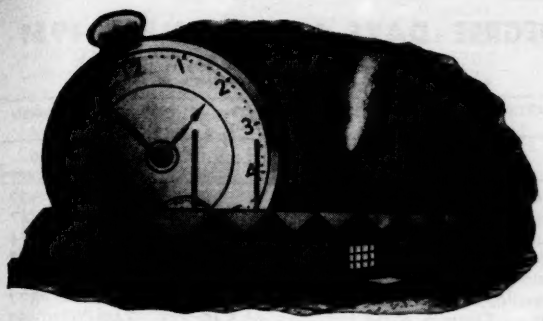

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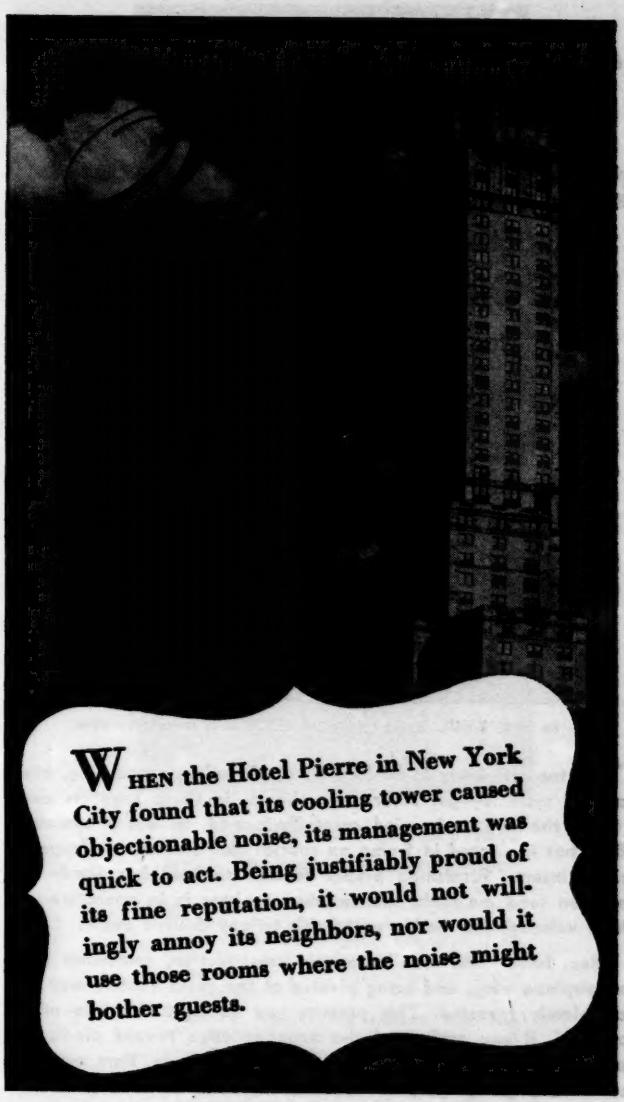

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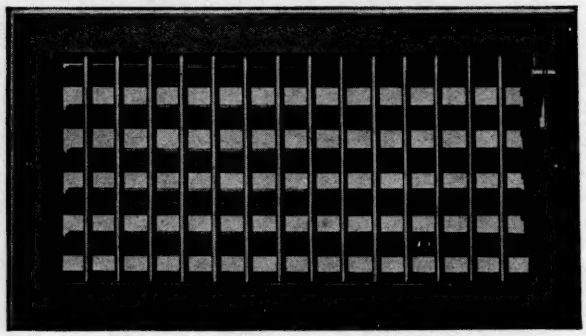


No. 1005 V-HML. Single bank of adjustable bars, multi-louver valve.

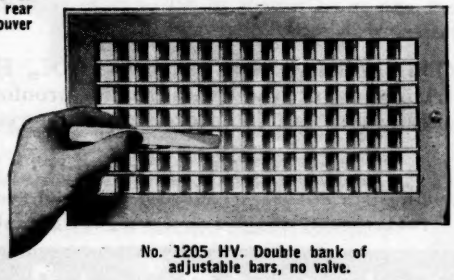
For top efficiency in modern air conditioning, ventilating, and cooling systems—get Auer Streamliners. In these registers and grilles, the bars are beveled, carefully formed, smooth in contour. Each bar is pivoted in frame on special split sleeves, or "expansion" inserts, furnishing proper tension to hold bar firmly in position (and maintain silence when register is in operation at high velocity) yet readily adjustable to any desired angle.

Bars have "tear-drop" shape in cross-section, somewhat like an airplane wing, and being pivoted at the exact center, may be completely reversed. This permits you to turn the *thin* edge outward, if you wish (and the *broader* edge toward air-flow), cutting resistance and turbulence to the minimum. Bars may be set in any grouping, and repeated adjustments will not affect their rigidity when set. Shutters of multi-louver control valves are pivoted on rivets to prevent any vibration. All Streamliner registers equipped with gaskets. Write for Folder S-50 with sizes and prices.

8 MODELS:

No. 1005 V. Grille only, with single bank of vertical bars.
No. 1005 H. Grille only, with single bank of horizontal bars.
No. 1005 V-HML. Register with single bank of vertical bars, and multi-louver valve.
No. 1005 H-HML. Register with single bank of horizontal bars and multi-louver valve.
No. 1205 VH. Grille only, with double bank of bars, front vertical, rear horizontal.
No. 1205 HV. Grille only, with double bank of bars, front horizontal, rear vertical.
No. 1205 VH-HML. Register with double bank of bars, front vertical, rear horizontal, and multi-louver valve.
No. 1205 HV-HML. Register with double bank of bars, front horizontal, rear vertical, and multi-louver valve.

Complete Auer Register Book—or Catalog G on perforated grilles sent on request.



No. 1205 HV. Double bank of adjustable bars, no valve.

The Auer Register Co., 6600 Clement Ave., Cleveland 5, Ohio

Auer REGISTERS & GRILLES for AIR CONDITIONING & GRAVITY

DEGREE-DAYS FOR DECEMBER, 1951

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING'S 24th Year of Publication of Monthly Degree-Day Data

City	December		
	1951	1950	Normal
Abilene, Texas (A)	508	635	592
Albany, New York (A)	1169	1218	1147
Albuquerque, New Mexico (A)	888	697	924
Alpena, Michigan (C)	1243	1279	1247
Anaconda, Montana (C)	(a)	1065	1238
Asheville, North Carolina (C)	736	931	837
Atlanta, Georgia (C)	549	749	639
Atlantic City, New Jersey (C)	734	870	893
Augusta, Georgia (A)	470	699	549
Baker, Oregon (C)	1257	918	1156
Baltimore, Maryland (C)	734	894	874
Billings, Montana (A)	1413	1035	1194
Binghamton, New York (C)	1043	1219	1156
Birmingham, Alabama (A)	484	772	595
Bismarck, North Dakota (A)	1832	1640	1553
Block Island, Rhode Island (A)	800	862	884
Boise, Idaho (A)	1156	884	1011
Boston, Massachusetts (A)	923	905	1026
Bozeman, Montana (C)	(a)	1127	1293
Buffalo, New York (A)	1062	1168	1104
Burlington, Iowa (A)	1258	1379	(a)
Burlington, Vermont (A)	1234	1242	1287
Butte, Montana (C)	(a)	1123	1261
Cairo, Illinois (C)	743	954	822
Charleston, South Carolina (C)	314	585	425
Charlotte, North Carolina (C)	632	780	679
Chattanooga, Tennessee (A)	645	839	694
Cheyenne, Wyoming (A)	1251	965	1144
Chicago, Illinois (C)	(a)	1271	1074
Cincinnati, Ohio (C)	846	1054	927
Cleveland, Ohio (A)	1065	1231	1060
Columbia, Missouri (A)	1047	1068	985
Columbia, South Carolina (C)	453	682	561
Columbus, Ohio (C)	992	1176	1017
Concord, New Hampshire (A)	1246	1129	1234
Concordia, Kansas (C)	1139	1032	1050
Dallas, Texas (A)	479	571	567
Davenport, Iowa (C)	1237	1385	1175
Dayton, Ohio (A)	1043	1271	1014
Deer Lodge, Montana (C)	(a)	1167	1331
Denver, Colorado (C)	1108	885	1017
Des Moines, Iowa (A)	1372	1387	1215
Detroit, Michigan (A)	1126	1218	1113
Devils Lake, North Dakota (C)	1874	1815	1710
Dodge City, Kansas (A)	1013	925	1004
Dubuque, Iowa (C)	1409	1443	1243
Duluth, Minnesota (C)	1675	1699	1519
Eastport, Maine (A)	1155	1004	1228
Elkins, West Virginia (A)	944	1169	1035
El Paso, Texas (A)	569	456	617
Ely, Nevada (A)	1439	927	(a)
Erie, Pennsylvania (C)	955	1131	1039
Escanaba, Michigan (C)	1369	1413	1344
Evansville, Indiana (A)	854	1100	862
Fargo, North Dakota (A)	1798	1805	1609
Fort Smith, Arkansas (A)	712	835	707
Fort Wayne, Indiana (A)	1159	1342	1138
Fort Worth, Texas (A)	476	576	574
Fresno, California (A)	620	428	577
Galveston, Texas (C)	196	254	270
Grand Junction, Colorado (A)	1293	912	1162
Grand Rapids, Michigan (A)	1197	1276	1147
Green Bay, Wisconsin (C)	1436	1580	1324
Greensboro, North Carolina (A)	749	903	760
Greenville, South Carolina (A)	613	794	738
Harrisburg, Pennsylvania (A)	954	1074	992
Hartford, Connecticut (A)	1005	1024	1060
Hatteras, North Carolina (C)	395	639	493
Havre, Montana (C)	1699	1262	1383
Helena, Montana (A)	1563	1187	1245
Houston, Texas (C)	239	279	335
Huron, South Dakota (A)	1671	1508	1431
Indianapolis, Indiana (A)	1060	1281	1017
Jackson, Mississippi (A)	393	636	(a)
Kansas City, Missouri (A)	1056	1056	1008
Knoxville, Tennessee (A)	669	912	781
La Crosse, Wisconsin (A)	1423	1591	1311
Lander, Wyoming (A)	1389	1023	1419

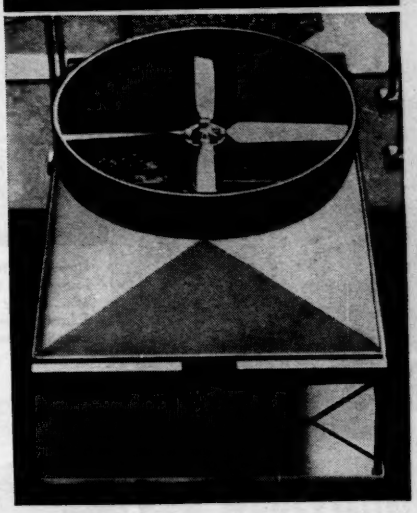
(a) Data not available.

City	December		
	1951	1950	Normal
Lansing, Michigan (A)	1215	1305	1209
Lewiston, Maine (O)	(a)	1074	1295
Lincoln, Nebraska (C)	1307	1160	1132
Little Rock, Arkansas (A)	625	805	651
Livingston, Montana (C)	(a)	949	1117
Los Angeles, California (C)	324	114	301
Louisville, Kentucky (A)	824	1066	849
Lynchburg, Virginia (A)	789	936	800
Macon, Georgia (A)	413	646	567
Madison, Wisconsin (C)	1346	1473	1321
Marquette, Michigan (C)	1349	1360	1302
Memphis, Tennessee (A)	594	844	663
Meridian, Mississippi (A)	406	673	549
Milwaukee, Wisconsin (A)	1270	1437	1221
Minneapolis, Minnesota (A)	1500	1627	1404
Moline, Illinois (A)	1283	1416	(a)
Montgomery, Alabama (A)	392	670	496
Nantucket, Massachusetts (A)	840	859	905
Nashville, Tennessee (A)	655	945	744
New Haven, Connecticut (A)	915	980	1017
New Orleans, Louisiana (C)	199	385	301
New York, New York (C)	798	924	940
Nome, Alaska† (A)	(a)	1263	1509
Norfolk, Virginia (C)	520	753	685
North Head, Washington (C)	726	507	654
North Platte, Nebraska (A)	1348	1065	1173
Oakland, California (C)	511	273	496
Oklahoma City, Oklahoma (C)	720	774	815
Omaha, Nebraska (A)	1385	1252	1175
Oswego, New York (C)	1046	1166	1138
Parkersburg, West Virginia (C)	834	1062	921
Peoria, Illinois (A)	1198	1364	1150
Philadelphia, Pennsylvania (C)	1590	916	884
Phoenix, Arizona (C)	378	183	425
Pittsburgh, Pennsylvania (C)	881	1084	967
Pocatello, Idaho (A)	1301	1004	1181
Portland, Maine (A)	1219	1096	1159
Portland, Oregon (C)	790	516	729
Providence, Rhode Island (C)	883	915	1026
Pueblo, Colorado (A)	1034	936	1029
Raleigh, North Carolina (C)	562	789	694
Rapid City, South Dakota (A)	1471	1116	1172
Reading, Pennsylvania (C)	873	1008	1001
Red Bluff, California (A)	615	498	(a)
Reno, Nevada (A)	1062	810	973
Richmond, Virginia (C)	676	849	763
Rochester, New York (A)	1078	1191	1125
Roswell, New Mexico (A)	711	663	808
Sacramento, California (C)	587	442	574
St. Joseph, Missouri (A)	1177	1146	1079
St. Louis, Missouri (C)	924	1087	936
Salt Lake City, Utah (A)	1199	912	1020
San Antonio, Texas (A)	319	377	347
San Diego, California (A)	285	160	288
Sandusky, Ohio (C)	1041	1206	1063
San Francisco, California (C)	460	345	428
Sault Ste. Marie, Michigan (A)	1448	1435	1370
Savannah, Georgia (A)	303	581	397
Scranton, Pennsylvania (C)	1003	1124	1085
Seattle, Washington (C)	773	520	719
Sheridan, Wyoming (A)	1450	1078	1320
Shreveport, Louisiana (A)	432	594	499
Sioux City, Iowa (A)	1462	1362	1265
Spokane, Washington (A)	1319	966	1057
Springfield, Illinois (C)	1064	1249	1039
Springfield, Missouri (A)	930	1001	893
Syracuse, New York (A)	1068	1241	1172
Tacoma, Washington (C)	819	549	756
Terre Haute, Indiana (A)	1036	1290	992
Toledo, Ohio (A)	1150	1293	1079
Topeka, Kansas (C)	1085	1038	1008
Trenton, New Jersey (C)	828	971	930
Utica, New York (O)	1124	1262	1144
Valentine, Nebraska (C)	1512	1185	1245
Walla Walla, Washington (C)	1044	741	896
Washington, D. C. (C)	746	907	896
Wichita, Kansas (A)	964	937	955
Williston, North Dakota (C)	1833	1578	1591
Winnemucca, Nevada (C)	1193	837	1080
Yakima, Washington (A)	1194	931	1091

(a) Data not available. †Nome data are for November.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

Aeromaster FANS
CUT POWER COSTS
10%!



Aerodynamic design provides more cooling per horsepower

In every case where Koppers new Aeromaster Fans have been installed, power costs have gone down! Up to 10% less horsepower is required for Aeromaster... and that piles up power savings *fast*!

Koppers engineering makes this big difference between Aeromaster and ordinary industrial fans. Blade profiles are an adaptation of high-speed, top-efficiency aircraft propeller blades for higher safety factor and improved anti-flutter performance.

Aeromaster Fans are available for any and every sizable industrial cooling application. Standard models range from 5 to 24 ft. dia., with 4, 6 or 8 blades per fan. Capacities up to 750,000 c.f.m. Engineering service furnished for special low pressure propeller fan installation. Sales engineers available in all principal U. S. cities, as well as in Europe.

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Aeromaster Fans
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KOPPERS

Gentlemen: Please send me detailed information on Aeromaster Fans for

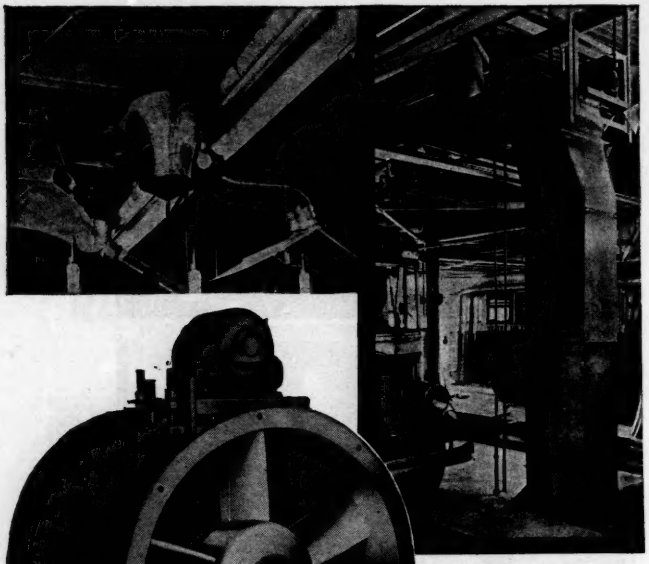
(name and type of equipment to be cooled)

Name

Title

Company

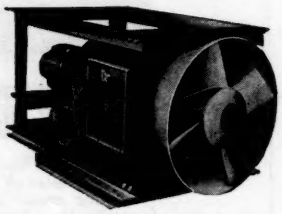
City Zone State



Upper left: Wingfoil Straight-Line Duct Fan in Textile Mill. Upper right: Wingfoil Elbow Type Duct Fan exhausting gases in a Garage.

Wingfoil Straight-Line Duct Fan

Wingfoil Elbow Type Duct Fan



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The Wingfoil Axial Flow Duct Fan, in either elbow type or straight line type, is a compact, economical fan designed to operate against static pressure. Both types have the motor outside the casing, unaffected by hot or dirty gases. Light weight, compact, easily handled, they may be inserted into a line of duct, either as an elbow or a straight section.

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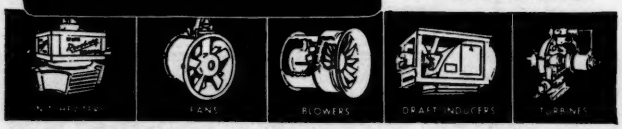
Factories: Linden, N. J., Montreal, Canada

Wing

AXIAL FLOW DUCT FANS



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EASTERN DIVISION:
DURANT INTERNATIONAL CORP'N
WILLIAMSTOWN
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Get away from old, "eye sore" ventilators—get the newly designed Muckle Vents. Engineered for better performance in moisture-laden air—the motor is out of line of air flow. A compact, good looking, easy to install all-in-one unit to fit any roof.

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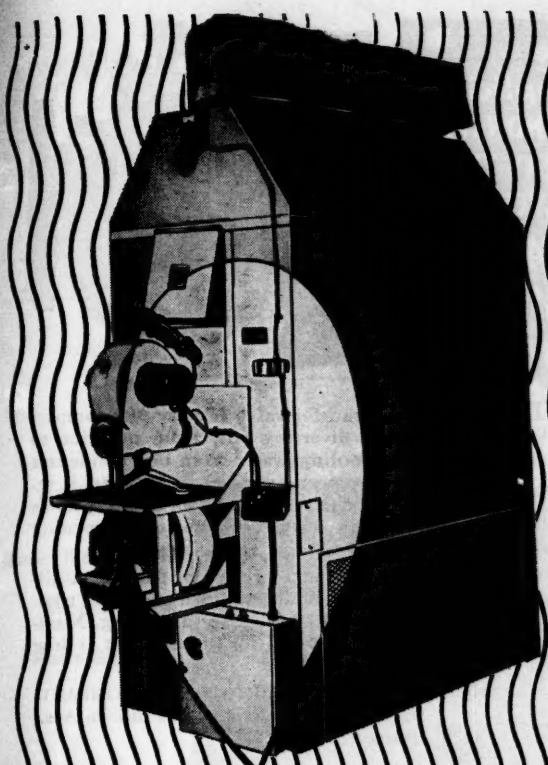

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. . . Long life and maximum efficiency depend on the amount of heat transfer surface. Olson, through the use of standard 10 gauge, 4" O. D. boiler tubes, gives even more effective heat transfer surface than the highest recommendation of accepted heating authorities.

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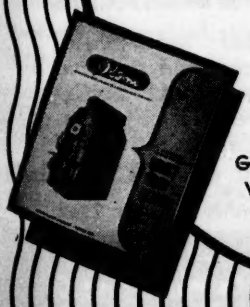

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KRITZER REASONING HAS HAD 39 YEARS OF SEASONING

Kritzer entered the heat transfer field in 1912 and this long experience is reflected in the ability of Kritzer Radiant Coils to heat anything, anywhere—yet remain economical, easier to install, more efficient in use, and absolutely true to their ratings. This last is backed by Kritzer's exclusive CERTIFIED RATINGS —ratings based on and proven by actual operation in the laboratory and the field.

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Ask for PROOF OF PERFORMANCE!

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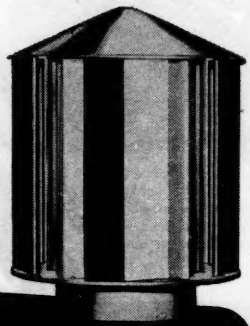

Patent No. 2269428

Breidert Air-X-Hausters

give you CERTIFIED and Published Capacity Ratings

Breidert ratings *are* based on tests made with wind blowing in all directions.* No matter which way the wind blows, barring interior negative pressures, the Breidert provides safe, sure ventilation ... on roofs, vent flues, chimney tops. Stationary, no moving parts, nothing to jam or get out of order.

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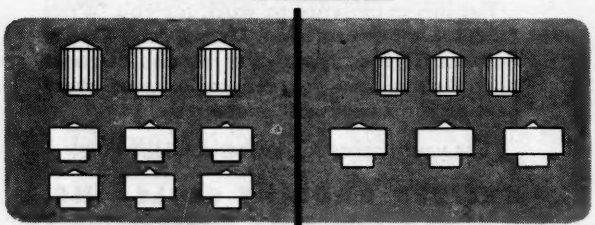

It takes fewer Breiderts to do the job as same size conventional ventilators. **(or)** *You can use the same number of smaller size Breiderts to do the same job as conventional ventilators.*

Get *all* the facts! Write today for complete Engineering Data Book, including certified capacity ratings. Address Dept. B.

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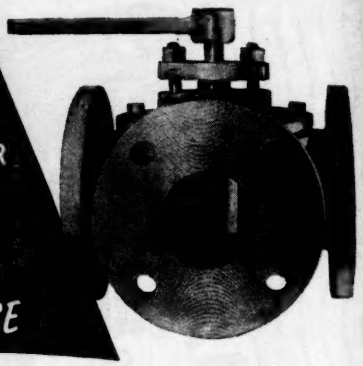
The *simplicity* of HONEYWELL 3-WAY TRANSFER VALVES will *SAVE YOU MONEY and SPACE*



THE HONEYWELL transfer valve is a simple, compact valve designed for diverting flow from one line to another—such as cooling water from one condenser to another or oil from one strainer to another. It replaces two conventional valves and fittings. Operates by movement of single lever . . . no chance of opening or closing both lines simultaneously.

Sizes 1½ to 8 inches . . . screwed or flanged. Available in high tensile iron body with iron or bronze trim. Body rating 125 lbs. ASA facing and drilling. Maximum inlet pressures 30 psi to 10 psi. Cost is low . . . act quickly.

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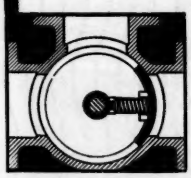

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VALVE PRODUCTS
First in Controls

for Appearance, *for* Lower Maintenance, *for* Emergency Reliability

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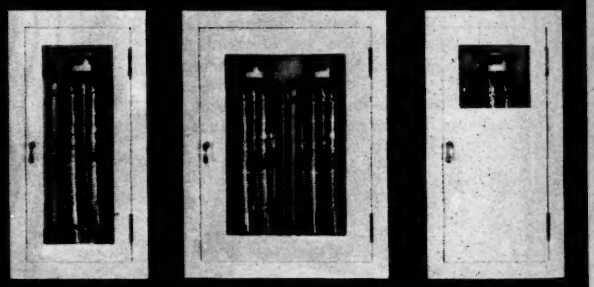

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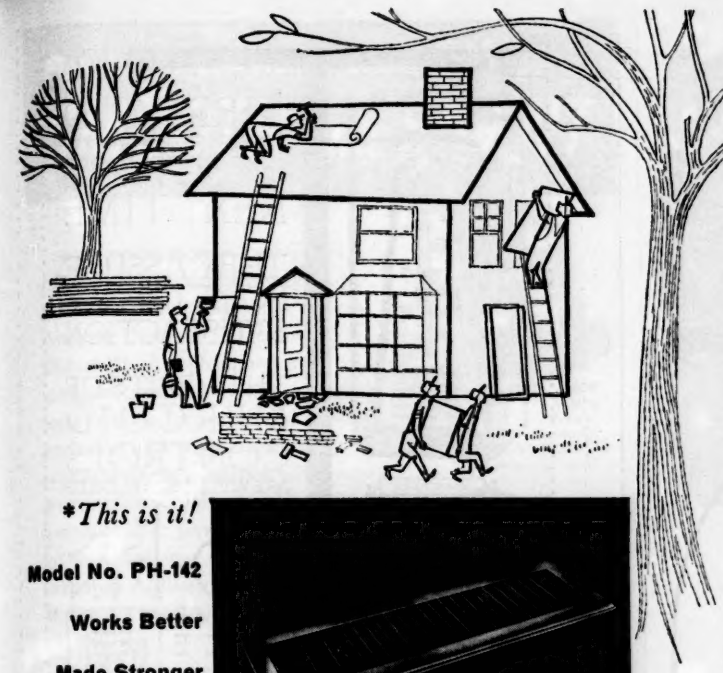

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Made Stronger

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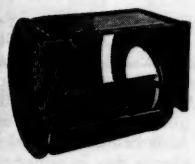
MASSACHUSETTS BLOWERS

Air Conditioning Furnace Blower Assembly. Designed for manufacturers of warm air furnaces and Air Conditioning equipment. Wheel Sizes 7½" to 27"



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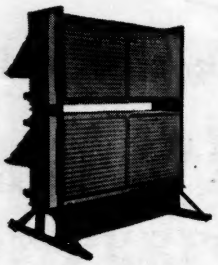

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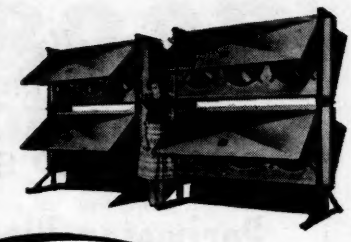

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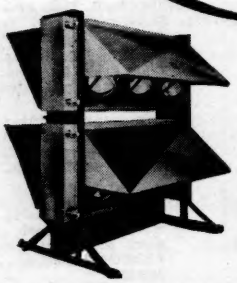

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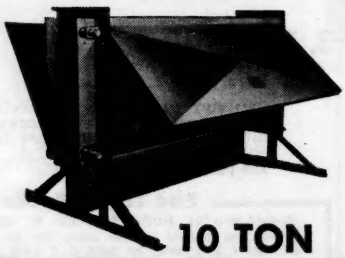

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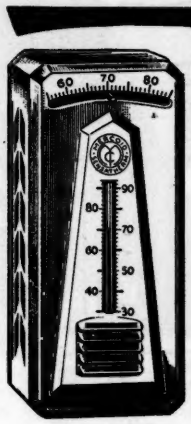

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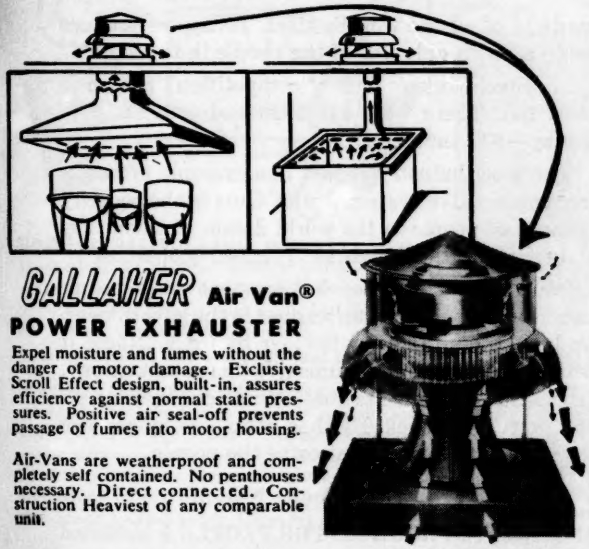

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Look around and see what happens when people hand their jobs and factories over to the government. Or have them taken by law. Or by force. Name it what you will—"communism", "nationalization", "socialism","regimentation"—it is a one-way street, and no turning back. By then people no longer own government. Government owns the people.

• • •

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BY O. SOGLOW

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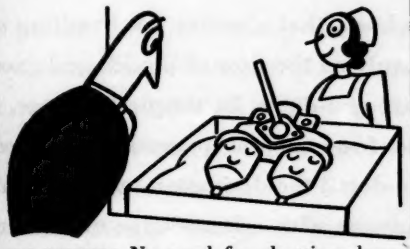

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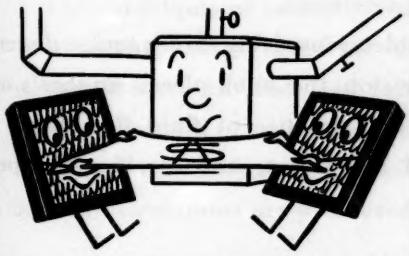

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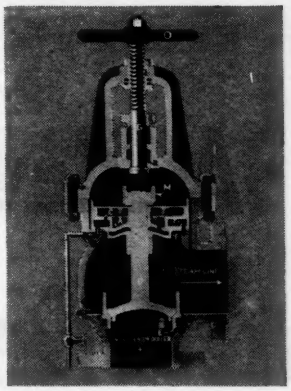

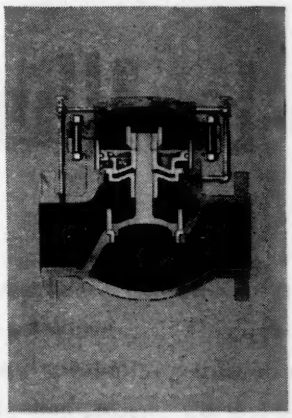

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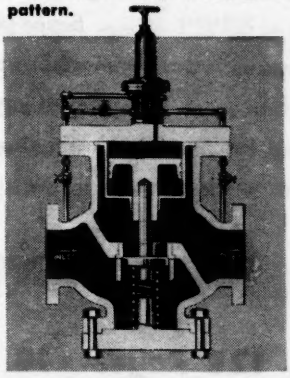

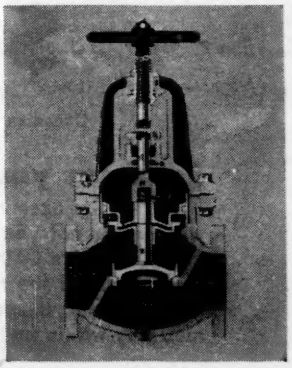

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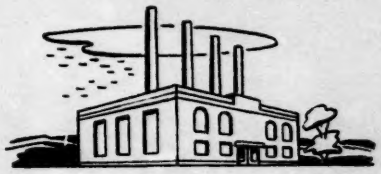

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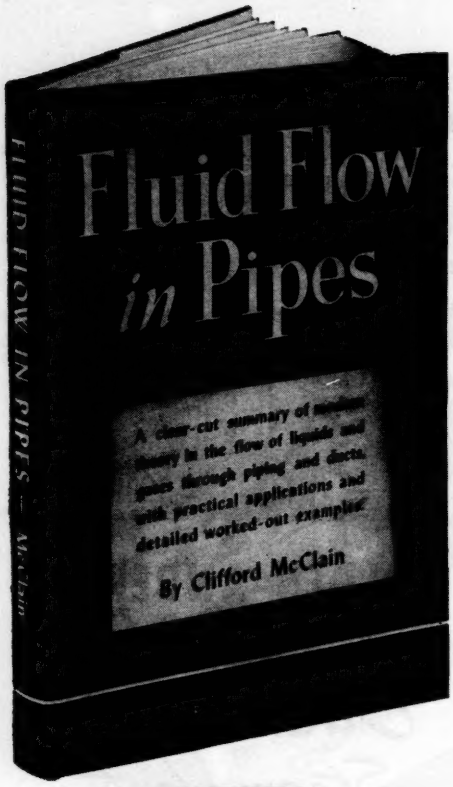

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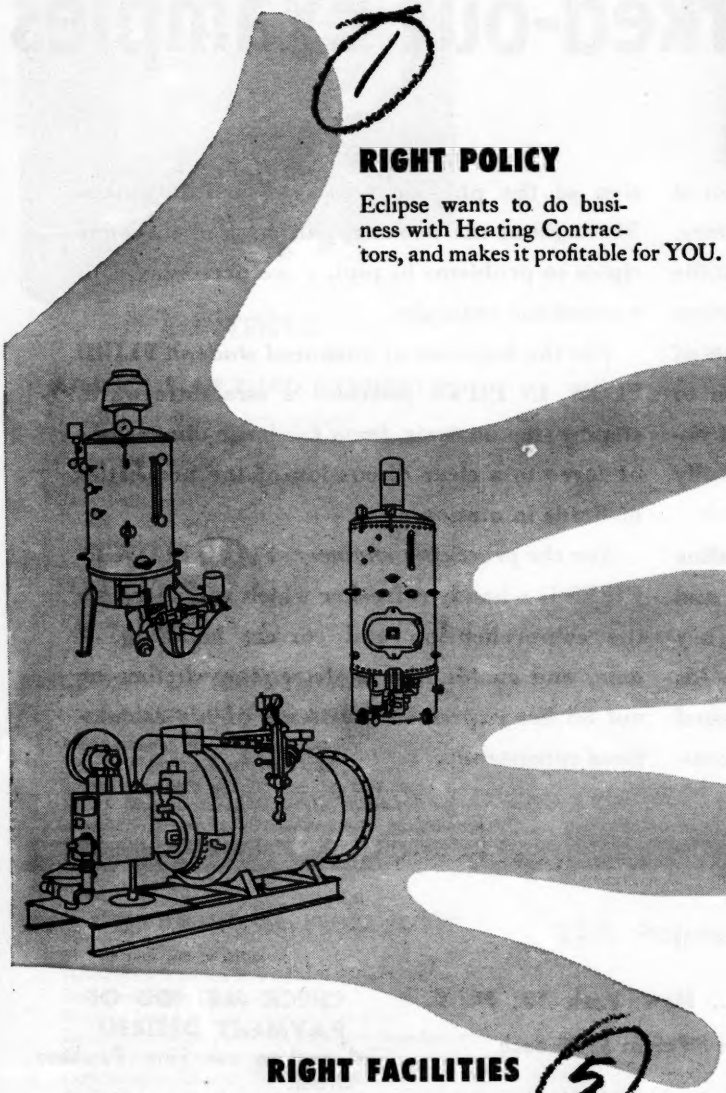

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*Advertisement appeared in preceding issue.

CORRECT DISK DESIGN
right from the start...

NOTE HOW THE DISK H... SPITE OF GRIT, TO POSITIV... VALVE.

WATTS ASME BOILER SAFETY RELIEF VALVES

No. 74-174 Series

Although modern A.S.M.E. rated boiler safety relief valves must be capable of discharging emergency steam pressure, it must be remembered that they are **primarily water relief valves.** Steam, although possible is **unusual** and very infrequent in hot water space heating boilers.

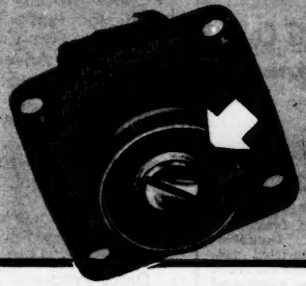
On the other hand, thermal expansion water pressure is a **normal** operating condition that occurs each time the boiler is fired. Ordinarily, the increased volume is absorbed by the expansion tank but if its capacity is exceeded, the relief valve opens to discharge—**water.**

Watts engineers did not lose sight of this fact when they designed Watts line of water relief valves, with a steam relieving feature, to comply with the new requirements of the A.S.M.E. low pressure heating boiler code. Right from the start, Watts No. 74 and 174 series design have included a resilient disk material which has always been the best design for tight closure and endurance in water service valves. As these facts are more generally recognized in the industry, other boiler safety relief valves will undoubtedly appear using resilient disk designs.

A tight closure is, naturally, the first engineering consideration because, obviously, a valve that will leak is a failure even before it can perform its intended function. Experience has shown valve designers that although metal to metal seating is best for steam service, it is unsuitable for dependable water valve service.

One reason for this is the fact that foreign bodies are not usually suspended in steam and therefore not apt to be carried to the valve seat. The opposite is true of water because rust, scale or grit can be carried with the flow and lodged at the point of closure. Any particle of grit caught between the inflexible surfaces of metal to metal seating prevents a perfect closure. Further, a small scar on highly polished metal surfaces is all that is needed to start a permanent leak—erosion will do the rest.

Several years ago Watts material research department found that Silicone Rubber had ideal characteristics for the disk requirements of our No. 74 and 174 series.



- POSITIVE SEATING.
- EXTREMELY LOW WATER ABSORPTION.
- ABILITY TO WITHSTAND HEAT UP TO 500°F.
- NON-VULCANIZING.
- LOW COMPRESSION SET EVEN AT HIGH HEAT.

However, this matters little to the G.E. Silicone Rubber disk in all Watts A.S.M.E. rated safety relief valves. Its high resilience allows the disk to simply envelope a particle of grit or erratic contour and still maintain a tight closure. At the next opening, grit is washed away and the disk resumes its original shape. The Silicone Rubber disk will safely stand up during periods of emergency steam pressure that a valve may encounter in service.

Watts No. 74 and 174 series were the first to offer complete pressure protection for nearly 100% of all hot water heating boilers with a single valve and the first available in a complete range of sizes from ¾" to 2" inclusive and with correspondingly higher rated B.T.U. steam capacities.

Dollar for dollar, no other valve can match the design superiority Watts A.S.M.E. rated safety relief valves—they are priced right!

WATTS Regulator Company

LAWRENCE, MASSACHUSETTS

Plumbing and Heating...Safety Valves and Controls

HEAT GAIN THROUGH UNINSULATED DUCTS

(Concluded from previous data sheet)

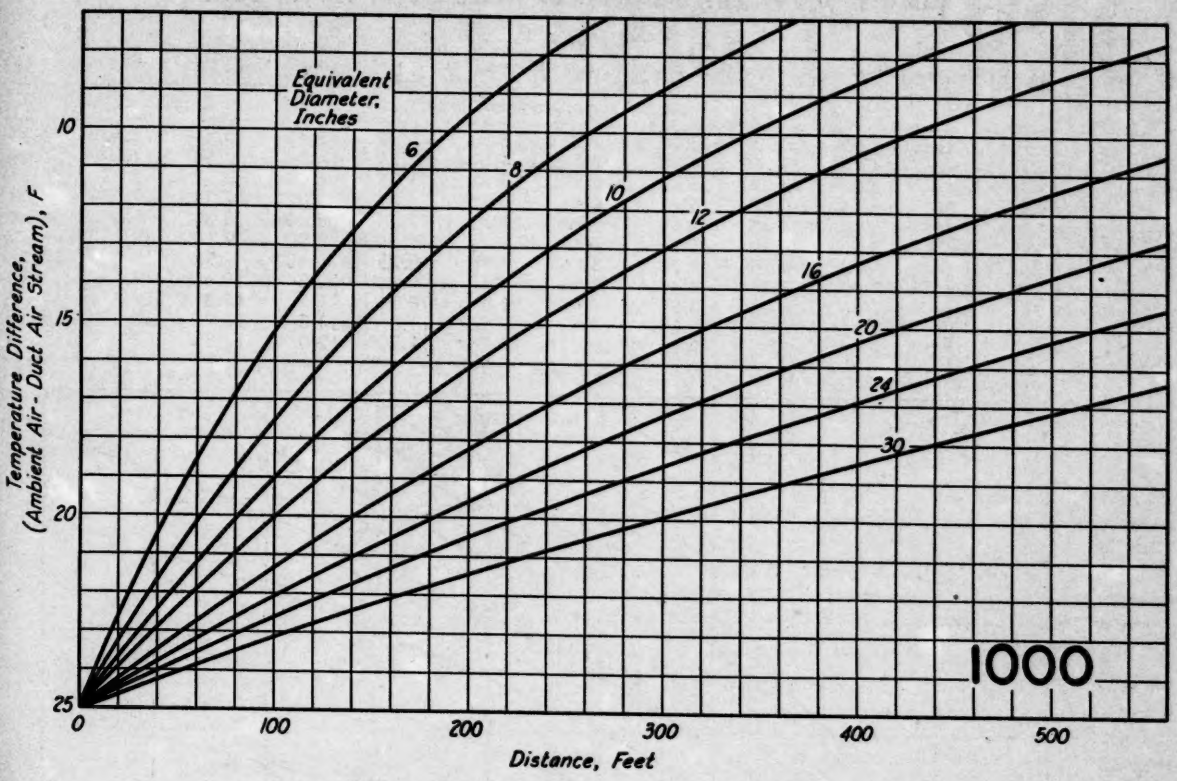


Fig. 3. Chart for 1000 ft per min air velocities.

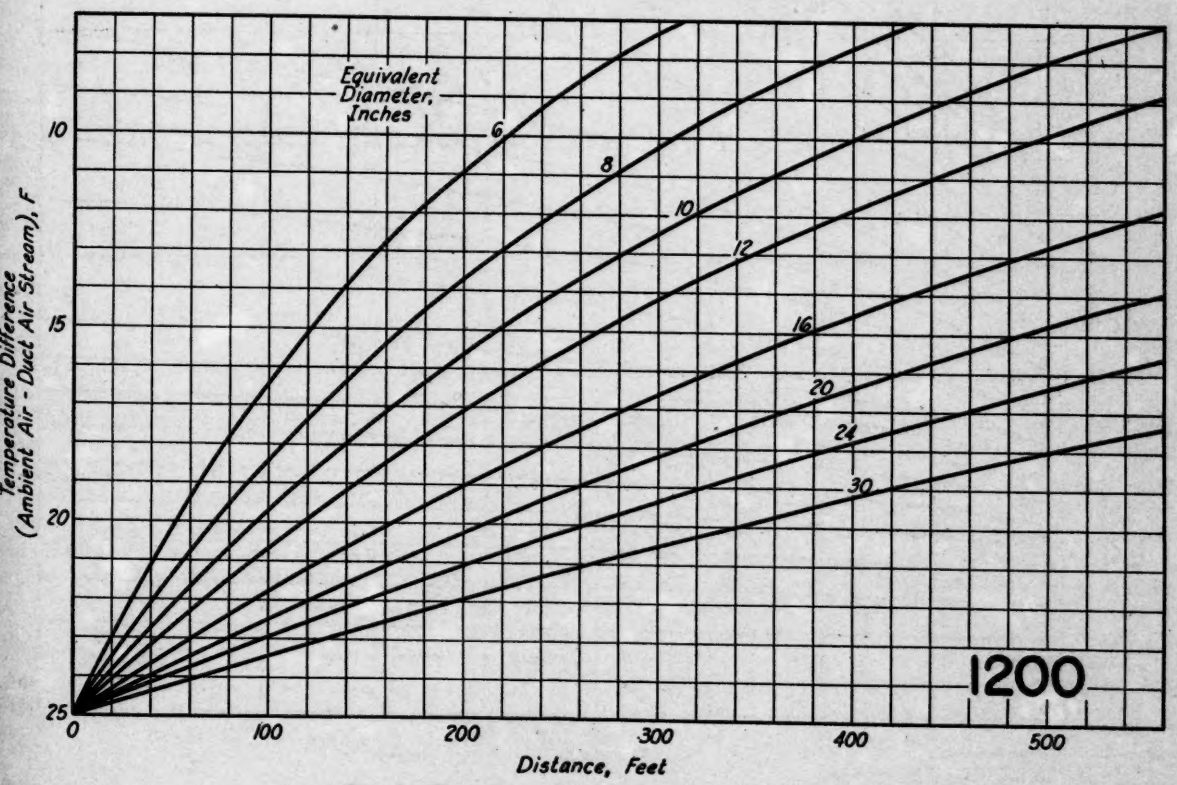


Fig. 4. Chart for 1200 ft per min air velocities.

HEAT GAIN THROUGH UNINSULATED DUCTS

TABLE 2. EQUIVALENT DIAMETERS OF SMALL RECTANGULAR DUCTS.

One Edge of Duct, Inches	Other Edge of Duct, Inches											
	4	5	6	7	8	9	10	11	12	13	14	15
	Equivalent Diameter, Inches											
2	2.67	2.86	3.00	3.11	3.20	3.28	3.33	3.38	3.43	3.46	3.50	3.53
3	3.43	3.75	4.00	4.20	4.36	4.50	4.61	4.71	4.80	4.86	4.94	5.00
4	4.00	4.45	4.80	5.09	5.33	5.53	5.71	5.86	6.00	6.12	6.23	6.31
5	4.45	5.00	5.45	5.83	6.15	6.41	6.66	6.87	7.05	7.24	7.37	7.50
6	4.80	5.45	6.00	6.45	6.85	7.20	7.50	7.76	8.00	8.20	8.40	8.58
7	5.09	5.83	6.45	7.00	7.46	7.86	8.24	8.56	8.85	9.10	9.35	9.55
8	5.33	6.15	6.85	7.46	8.00	8.46	8.90	9.25	9.60	9.92	10.2	10.4
9	5.54	6.41	7.20	7.86	8.46	9.00	9.48	9.90	10.3	10.6	11.0	11.2
10	5.71	6.66	7.50	8.24	8.90	9.48	10.0	10.5	10.9	11.3	11.7	12.0
11	5.86	6.87	7.76	8.56	9.25	9.90	10.5	11.0	11.5	11.9	12.3	12.7
12	6.00	7.05	8.00	8.85	9.60	10.3	10.9	11.5	12.0	12.5	12.9	13.3

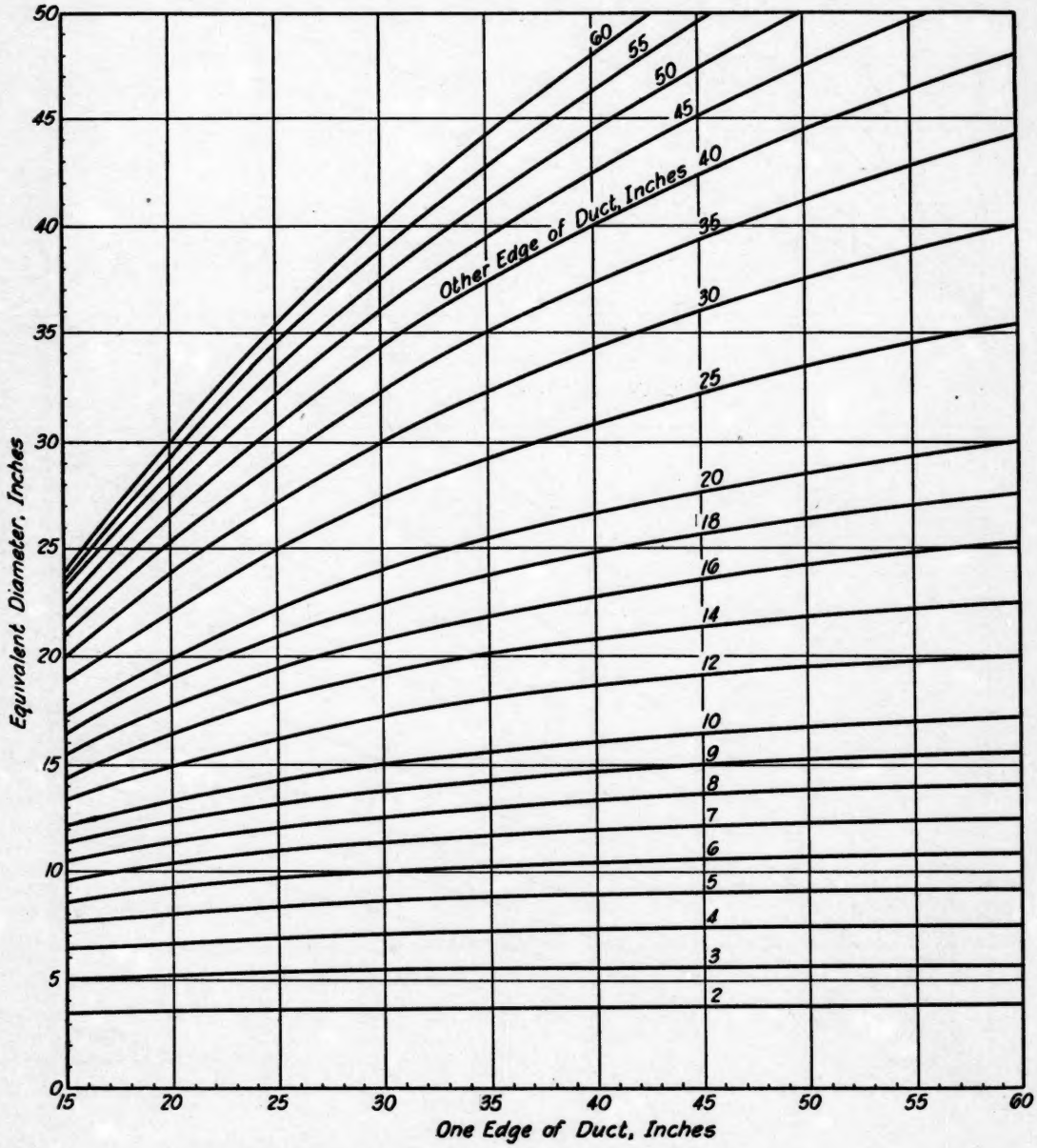


Fig. 5. Equivalent Diameters of Large Rectangular Ducts.

A

W
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13

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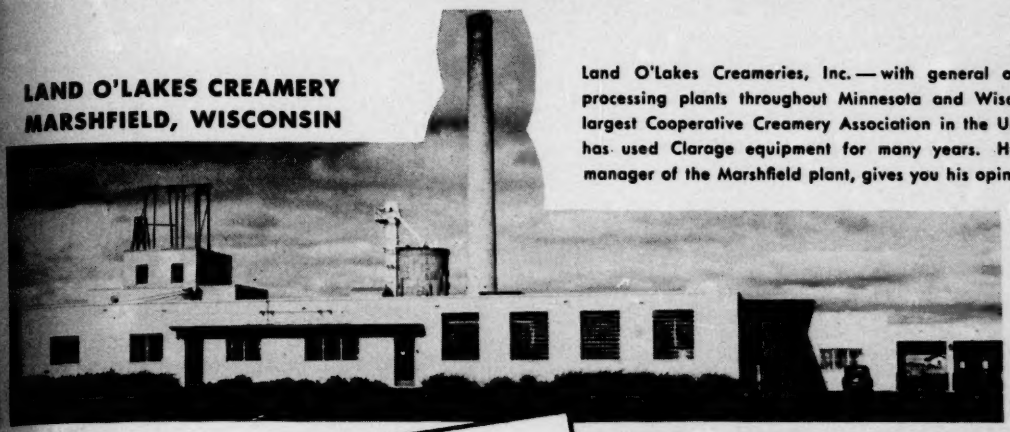
A Clue to What You May Expect from CLARAGE MULTITHERMS

LAND O'LAKES CREAMERY
MARSHFIELD, WISCONSIN



Land O'Lakes Creameries, Inc. — with general offices in Minneapolis and processing plants throughout Minnesota and Wisconsin — is the oldest and largest Cooperative Creamery Association in the United States. Land O'Lakes has used Clarage equipment for many years. Here, Mr. Glenn C. Kanten, manager of the Marshfield plant, gives you his opinion of Clarage Multitherms.

LAND O'LAKES
CREAMERIES INCORPORATED

LAND O' LAKES CRMY.
MARSHFIELD, WIS.

January 8, 1952

Clarage Fan Company
Kalamazoo, Michigan

Gentlemen:

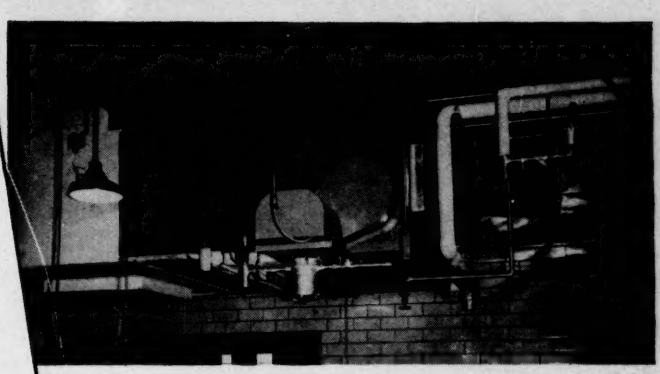
We would like to report our experience with the five Clarage Multitherm air conditioning units installed here in our new plant in Marshfield during the spring of 1950.

We have found all five units entirely satisfactory. They far exceed our expectations. The air is properly conditioned summer and winter—even on the coldest days our walls are dry. This Clarage equipment maintains ideal conditions both for our processing and for the health and comfort of our employees.

We do not hesitate to recommend Clarage Multitherm units for creamery air conditioning and similar types of process plants.

Yours truly,
Glen C. Kanten
Glen C. Kanten, Manager
Marshfield Branch Plant

C: L. L. Getten - LOL, Mpls.
Dick Condon



Five Multitherm Units comprise this air conditioning installation. They are installed at the ceiling level as shown above; need no valuable floor space. They provide heating in winter, cooling in summer, and dehumidification the year round. If you have almost any type of heating, cooling or complete air conditioning requirement, here are units worthy of your inquiry.

Incidentally, Clarage mechanical draft equipment is giving equally fine service in this plant.

WRITE FOR CATALOG 1307A

NEW MULTITHERM CATALOG contains many helpful suggestions for solving heating, cooling or complete air conditioning problems with guaranteed performance. Send for your copy today.

YOU CAN RELY ON

CLARAGE

HEADQUARTERS FOR AIR HANDLING & CONDITIONING EQUIPMENT

Clarage Fan Company 629 PORTER STREET **KALAMAZOO, MICH.**

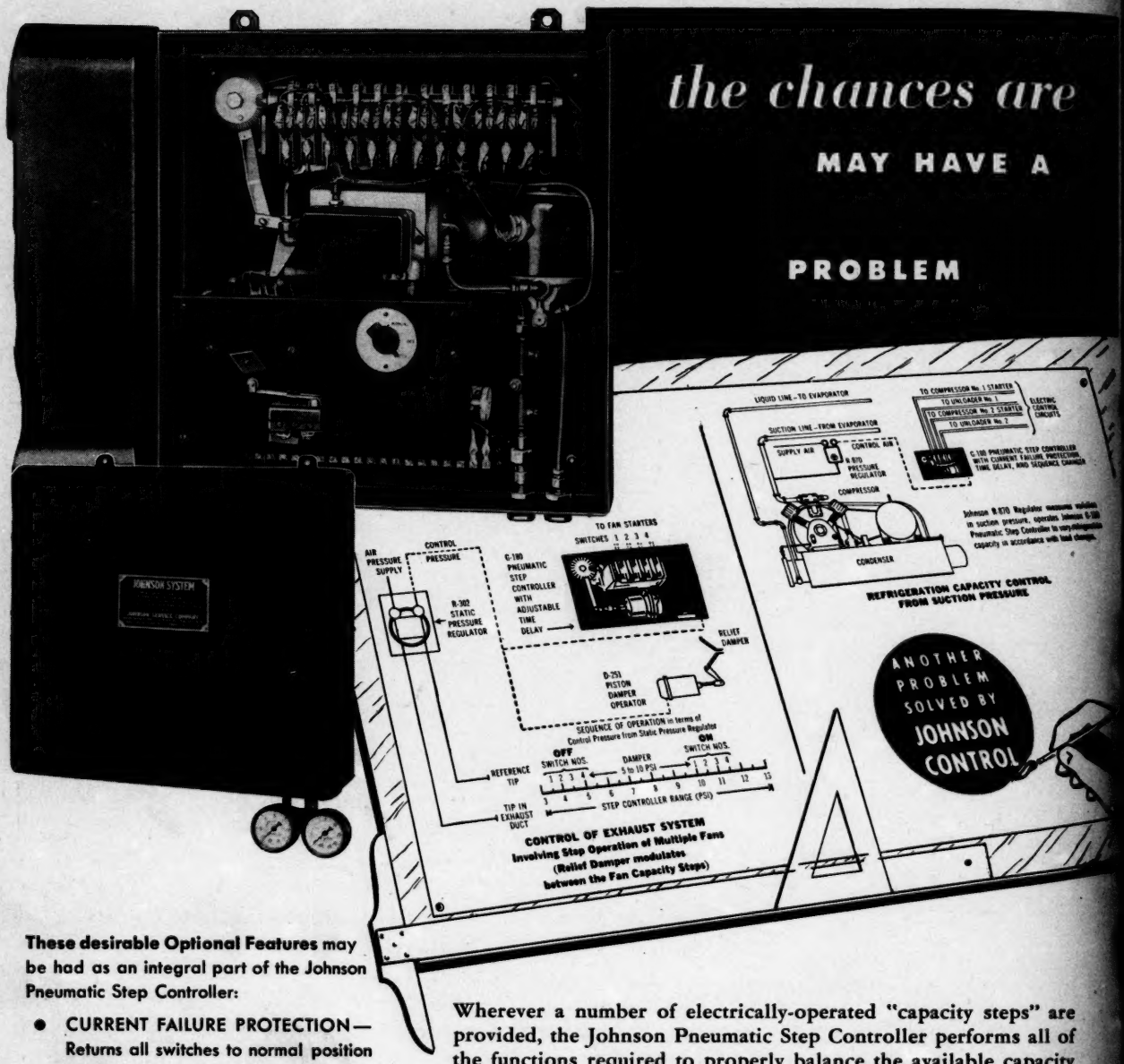
SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

the chances are

MAY HAVE A

PROBLEM


LIQUID LINE - TO EVAPORATOR
SUCTION LINE - FROM EVAPORATOR
SUPPLY AIR
CONTROL AIR
R-870 PRESSURE REGULATOR
COMPRESSOR
CONDENSER
TO COMPRESSOR No. 1 STARTER
TO UNLOADER No. 1
TO COMPRESSOR No. 2 STARTER
TO UNLOADER No. 2
ELECTRIC CONTROL CIRCUITS
G-180 PNEUMATIC STEP CONTROLLER WITH CURRENT FAILURE PROTECTION, TIME DELAY, AND SEQUENCE CHANGER
REFRIGERATION CAPACITY CONTROL FROM SUCTION PRESSURE
AIR PRESSURE SUPPLY
CONTROL PRESSURE
R-302 STATIC PRESSURE REGULATOR
G-180 PNEUMATIC STEP CONTROLLER WITH ADJUSTABLE TIME DELAY
TO FAN STARTERS
SWITCHES 1 2 3 4
RELIEF DAMPER
D-251 PISTON DAMPER OPERATOR
SEQUENCE OF OPERATION in terms of Control Pressure from Static Pressure Regulator
OFF SWITCH NOS.
DAMPER 5 to 10 PSI
ON SWITCH NOS.
REFERENCE TIP
TIP IN EXHAUST DUCT
STEP CONTROLLER RANGE (PSI)
CONTROL OF EXHAUST SYSTEM
Involving Step Operation of Multiple Fans
(Relief Damper modulates between the Fan Capacity Steps)
ANOTHER PROBLEM SOLVED BY JOHNSON CONTROL

These desirable Optional Features may be had as an integral part of the Johnson Pneumatic Step Controller:

- CURRENT FAILURE PROTECTION—Returns all switches to normal position in less than one second.
- TIME DELAY MECHANISM—Provides adjustment, to any desired period up to 12 minutes, of the time required to operate all switches. Then, on current failure or at "start-up", the predetermined time interval must elapse between the individual steps of control.
- AUTOMATIC or MANUAL SEQUENCE CHANGER—Varies the succession of the steps of control in order to equalize the wear on equipment.

Wherever a number of electrically-operated "capacity steps" are provided, the Johnson Pneumatic Step Controller performs all of the functions required to properly balance the available capacity and the load. This unique, single unit, operated by a Johnson pneumatic temperature, humidity or pressure regulator, actuates separately adjustable, single-pole, double-throw switches in any desired sequence. It is available in 4, 6, 8 and 12-switch models and eliminates the disadvantages of a series of separate pressure switches. Such difficulties as providing sufficient space, maintaining separate delicate mechanisms, adjusting and retaining adjustment are completely avoided.

Yes! The CHANCES ARE that the Johnson Pneumatic Step Controller will solve your sequence control problems. Ask a nearby Johnson engineer to discuss the application of this interesting device. Bulletin G-180 presents the essential features. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

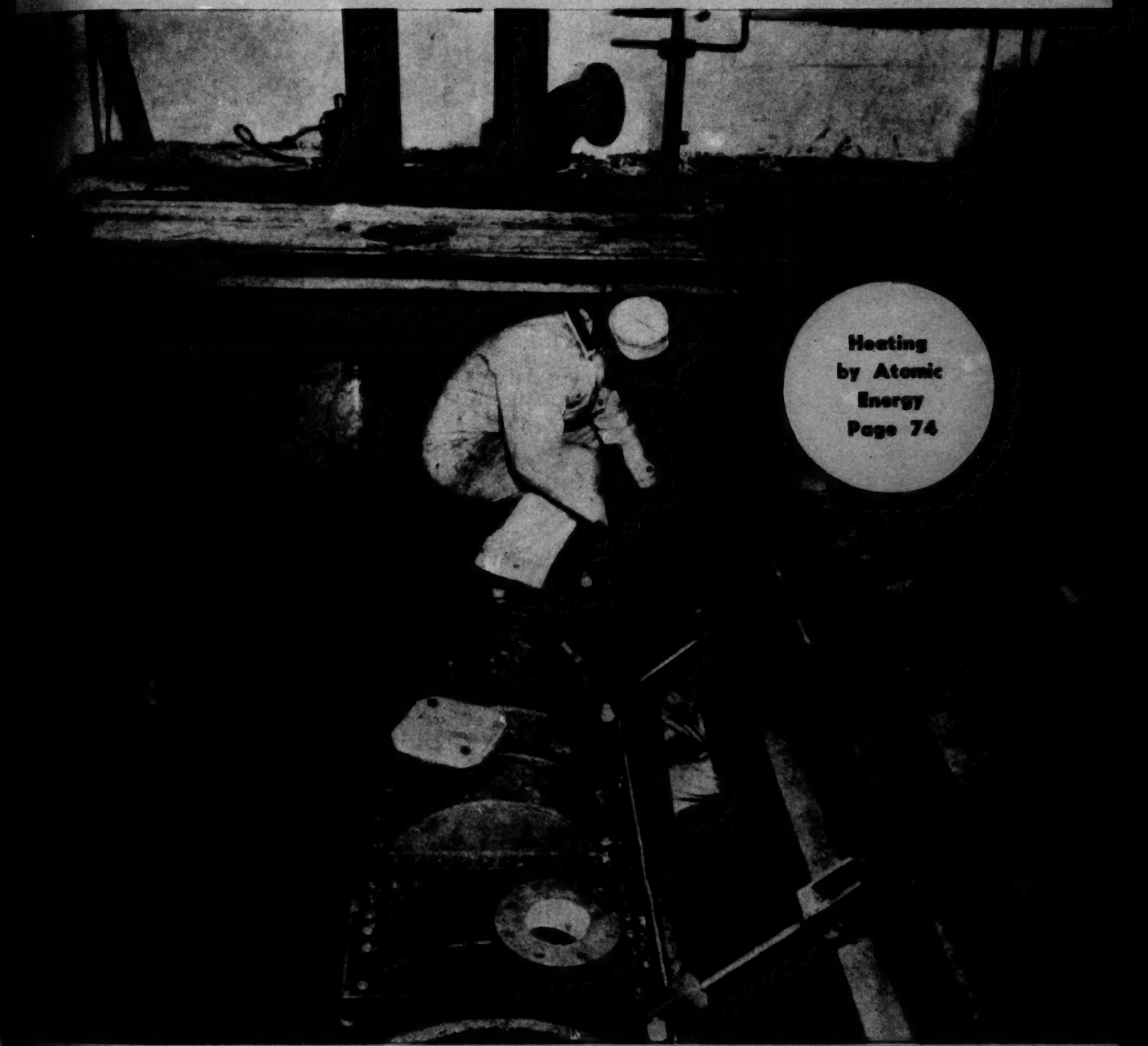
JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

MANUFACTURE • APPLICATION • INSTALLATION • SINCE 1885

MARCH, 1952

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION



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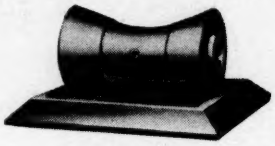
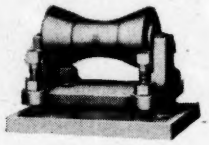
for every piping requirement

NO. 3 OF A SERIES SHOWING THE GRINNELL LINE

pipe rolls

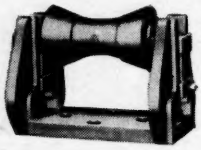


Pipe Roll and Plate
Fig. 277
2 to 30 in. pipe

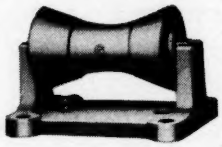


Adj. Pipe Roll with Base
Fig. 274
Without base: Fig. 275
2 to 30 in. pipe

Adj. Swivel Pipe Roll
Fig. 174
2½ to 12 in. pipe



Adj. Pipe Roll
Fig. 276
4 to 30 in. pipe



Pipe Roll Complete
Fig. 271
2 to 30 in. pipe

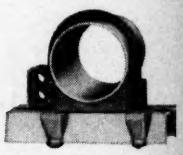
Single Pipe Roll
Fig. 171
1 to 30 in. pipe

pipe saddles

Pipe Stanchion Saddle
Fig. 259
4 to 36 in. pipe

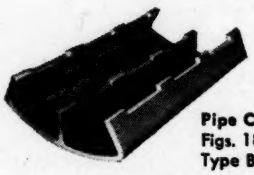
Adj. Pipe Saddle Support
Fig. 264
2½ to 36 in. pipe

Pipe Saddle Support
Fig. 258
4 to 36 in. pipe



Anchor Chair
Fig. 197
4 to 24 in. pipe

Pipe Covering Protection Saddle
Figs. 185, 186, 187, 188
Type A for 10 in. and smaller



Pipe Covering Protection Saddle
Figs. 185, 186, 187, 188
Type B for 12 in. and larger

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WHENEVER PIPING IS INVOLVED

Grinnell Company Inc., Providence, Rhode Island • Sales Offices and Warehouses in Principal Cities

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco humidification and cooling systems

NEW Low Priced PANEL VENT SETS for Low S. P.

DeBothezat Panel Vent Sets have die-formed blades and welded steel housing.

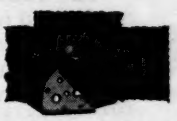
BALL BEARING MOTOR

Totally enclosed ball bearing motor of nationally known manufacture. Non-overload power characteristic prevents motor burn-out.

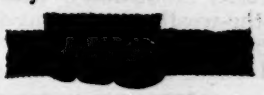
EASY TO INSTALL AT ANY ANGLE

Square panel and ball bearing motor construction make installation easy. Can be mounted vertically, horizontally or at any angle.

QUIET OPERATION



Slow speed "V" belt drive assures quieter operation. Cast drive sheave is accurately machined and carefully balanced.

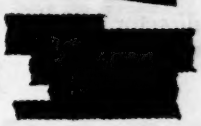


MINIMUM TURBULENCE

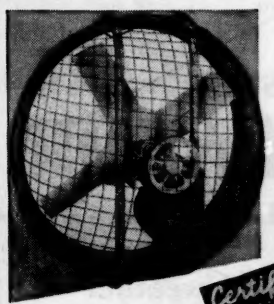
Streamlined venturi directs air-flow into fan wheel with minimum turbulence.

SMOOTH RUNNING

Every Panel Vent Set is carefully balanced for smooth running.



DeBothezat Panel Vent Sets are made with fan wheels 24", 30" and 36" in diameter with certified capacities up to 13,190 CFM. These units are fully guaranteed.



Safety screen guards and shutters available as accessories.

Certified Ratings

PFMA

DE BOTHEZAT FANS